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The Oxyhydrogen Gas Company of Buffalo.

[A contributor to the *American Artisan* furnishes the following to our scissors.]

It has long been known to chemists that the salts of the higher oxides of manganese possessed the property of easily giving up part of their oxygen, and of as easily reuniting with it. The permanganates have long been used in the chemical laboratory for this purpose, and their value as disinfectants depends on the same property. But no use was made of them on a manufacturing scale, until M. Tessie du Motay perfected his process for obtaining oxygen by means of the soda salt. The process has been in use in Europe for some time, and was introduced into the United States by the Buffalo Oxyhydrogen Gas Company, in 1872, at Buffalo, N. Y.

In August, 1872, the company commenced supplying the gas to its customers, and since then has continued to do so. It has met with much opposition from the manufacturers of coal gas, but has manfully borne the brunt of battle, and still struggles on. It is not as yet a success financially, as they are not making the amount of gas intended, the winter putting a stop to the laying of pipes before they were ready.

The buildings are substantially built of brick and iron, the main one being 110 by 80 feet ground plan, and about 40 feet high. In this building the gasogenes, retorts, purifiers, and other apparatus and machinery are principally to be found. The other buildings are the coal and lime houses, the store house, laboratory, office, and a few others. The gas holders are uncovered as yet, and consist of two for hydrogen and one for oxygen.

In making the hydrogen, advantage is taken of the property of intensely heated carbon to decompose water, forming hydrogen and carbonic oxide. The carbonic oxide is afterwards separated, and the free and pure hydrogen used. Carbon, either in the form of anthracite coal or coke (coke being the best), is heated to a high temperature by kindling it and blowing a current of air through it. When the proper heat is obtained, which occurs in about ten minutes after the air-blast is turned on, steam is forced through it. A reaction takes place, the oxygen of the steam (H O) uniting with the carbon (C) forms carbonic oxide (CO), leaving the hydrogen (H) free and uncombined.

The mixed gases now leave the gasogene, and pass to the purifiers. This reaction goes on for about twenty minutes, when the steam is shut off, and the air allowed to pass in again. In the purifiers, which are iron retorts containing calcic hydrate, heated to a red heat, the carbon is still further oxidized, forming (CO_2) carbonic acid, and it then unites with the lime to form carbonate of lime ($Ca\ CO_3$). When all the lime is changed to carbonate, which occurs in about 10 minutes, the gases are shut off, and steam introduced. The steam breaks up the combination just formed, driving out the carbonic acid and reproducing calcic hydrate. Then the gases are allowed to pass in again. From the purifiers the gas, now freed from carbonic oxide, passes to the scrubber, which consists of a series of perforated iron shelves, arranged one above the other, in an upright cylinder of iron. The gas passes up, through, and over these shelves, down which a stream of water is constantly running. Here all final traces of impurity are washed out and carried away with the water. From this it passes to the holder for pure hydrogen, which is a small one, holding only about 3,000 cubic feet. This also serves as a regulator of pressure, which is maintained at about 2½ to 2¾ inches.

The gas now goes to the carburetter, where it passes over naphtha contained in shallow pans, arranged similarly to the shelves in the scrubber. An almost constant temperature of 70° Fahr. is maintained in this vessel, by means of a continual stream of water on the outside. The gas here absorbs some of the naphtha, about four gallons being taken up by 1,000 feet of gas. Of course the carburetter is so arranged as to catch all the drippings of waste naphtha.

The gas at this state of manufacture is superior to that of the common air-naphtha gas machines, in which air is forced through naphtha, as all the naphtha in such gas can be frozen out of it, which is not the case with the gas we are considering. With a common burner, this gas now burns nearly as well as common coal gas, and it is only when a large head is turned on that any flickering occurs.

But the gas is not yet made complete. It must pass through the carburetting retort, where it is exposed to a temperature of 700° Fahr., and where the hydrocarbon is "burnt in," as they call it. Now a severe cold will not cause the hydrocarbon to deposit, and this has been severely tried during the past winter. Of course this gas is troubled with water freezing in the pipes, like any other; but the illuminating principle is not deposited on a reduction of temperature.

From these retorts the gas passes through the coolers, which are just the same as those used in the ordinary coal gas works—simply upright pipes connected together at top and bottom. From these it passes to the holders.

The above paper was on hydrogen. In this we will consider the preparation of the oxygen. The pulverized manganate of soda, before mentioned, is introduced into iron retorts about seven feet long, one foot wide, and two deep (a cross-section being an ellipse). It is here heated in a current of superheated steam of about the same temperature, that of a lively red heat. The steam passes through the mass, and carries with it part of the oxygen. In ten minutes the current of steam is shut off, and atmospheric air blown in; the soda salt now re-absorbs or re-unites with the oxygen and the nitrogen escapes. The air must be free from carbonic acid gas; and to extract this it first passes through the hot lime purifiers, air is passed in for ten minutes, and then steam as before.

From the retorts the gases pass to the condensers, which are like the usual upright cast-iron pipes used in all gas works. Here the steam is condensed, and it washes the gas; from these the gas passes to the scrubber, similar to the one used for hydrogen, where all further impurities are washed out; it then passes to the holder.

The patent claims perfect working in all parts of the process, but the actual experience shows some variation from it. It is found that all the carbonic acid is not extracted in the passage through the lime purifiers, and also that all of what is absorbed is not removed by the current of steam, so that the lime requires changing about once a month.

It is also found that the manganate does not quite work to perfection. It is put in, porous and pliable, but after a while it becomes agglomerated, and grows more and more so the longer it is used. The company started in August, 1872, and in March, 1873, they found it necessary to re-charge with the manganate. Dr. A. P. Southwick, the able and courteous superintendent of the works, is led to believe, from his observations, that could the steam be supplied perfectly dry no caking would occur. He has observed that the retort nearest the superheaters was in the best condition, and the further from it the more compact was the salt.

The gas is supplied at a pressure of about two and a half inches at the works; at this pressure the leakage is merely nominal. In case of leakage, the hydrogen could be easily detected, if it possesses an odor, but with the oxygen the case is different. It is intended, however, to introduce some gas which, while having an odor, will not be deleterious or injure the illuminating power. Just what gas to use is not yet decided on, although chlorine seems to have more in its favor than any other.

The hydrogen gas is supplied to customers at $2.50 per thousand, and the oxygen at $5 per thousand. It will be easily seen that this is the cheapest oxygen ever offered for sale, although at this figure the company is at present losing money. If, however, they can run to the amount calculated (which, by the way, will be much less than their capacity), they can supply at that price and have a profit. At present they are working only about nine hours out of the twenty-four, and the balance of that time the fires must be kept, although not used.

The burner is similar to the Argand burner, the oxygen pipe being inside of the hydrogen. There is a double stop-cock so arranged that both gases are turned on at once; and generally a small explosion is produced when the gas is lighted.

The establishment of these works is an experiment

looked at with much interest by all, especially as they claim one-third reduction in the expense to consumers. Many have predicted the complete failure of the company and process—but they still live; and next year will establish or overturn the theory that these two gases can be used and supplied cheaply and profitably.

[Our own readers are already "posted" later than this, on some points. Further hereafter.—Ed.]

Sulphur in London Gas.

The instructions of the metropolitan gas referees for the summer months have just been issued, and they contain an important announcement as regards "sulphur compounds other than sulphuretted hydrogen." They say: "The maximum amount allowable shall be 20 grains of sulphur in 100 cubic feet of gas. This maximum shall apply to gas made at Beckton and Bow from the present date, and to gas made at other works from June 30." This order has created some consternation at the "other works," and will, we dare say, be followed by protests and remonstrances such as induced the late referees to withdraw a similar order.

The question of sulphur purification has made but little progress. One thing we know to a certainty, and it is that, by the judicious use of lime, sulphur can be kept within very narrow limits. But the objection made to its use is that it creates a nuisance. Now, is this a necessity? We think not. Foul lime covered up, as soon as removed, with other lime which has been exposed to the air for a day or two, gives off no smell, and no nuisance need be produced by this treatment. In very crowded works the want of space to spread the lime upon would prove an obstacle to the use of this plan, and we think the referees should take into consideration the conditions at each particular station before one general order is made. We should, however, rejoice to see the use of lime superseded, on account of its expense as well as the possibility of a nuisance; and we are glad to hear that Mr. Patterson's process of scrubbing with solutions of alkaline sulphides is having, or is about to have, a trial at the South Metropolitan works. The success of this plan would solve the difficulty at once, and comparatively unimportant additions to, or alterations of present plant, would secure complete purification without offence in any locality.—*Jour. of Gas-Lighting.*

Station Meter and Consumption Accounts.

The London *Journal of Gas-Lighting* tells us that a Commission of the London "Board of Trade" on the price of gas, referring to excess of make over consumption account, referring to the amount of unaccounted for gas which, in the case of the Chartered, is in excess of that of any other metropolitan gas company, make a general remark, which is worth quoting. "Gas companies," they say, "would be in a better position if they secured a distinction between different kinds of waste; and especially if they kept a record of the quantity of gas consumed in their works and offices, and by the gas examiners, and in other similar ways, which gas might be brought into account on both sides of the account." Taking only one of these particulars—the amount consumed at the testing stations—it must be remembered that the Chartered Company in the past year have had to supply five of these stations, and considering the warming and ventilating arrangements, in addition to the gas required for testing, the consumption must have been very considerable at each. This and the consumption at works and offices would account for much, but, certainly, for only a small proportion of the "leakage." It seems clear that the distributory apparatus of the company requires overhauling, and to do this effectively would necessitate the expenditure of a considerable amount of capital, the dividend on which would go some length towards balancing the estimated loss from real leakage. Still it would be to the interest of the company to expend the money.

Chemical Repertory.

No. 94.—June 16, 1873.

EDITOR—HENRY WURTZ.

CHEMICAL EXCERPTS.

759. Marsh Gas from Wood-Spirit.—Maumene.—The author states that by the incomplete combustion of methylic alcohol in a specially constructed apparatus, marsh-gas has been obtained by him.—*Paris Chem. Society.*

760. Saltpetre Decomposed by Boiling.—Maumene.—Since Lavoisier's investigation of this subject, it has always been held that the loss experienced by the continued boiling (evaporation) of an aqueous solution of the salt alluded to is due to particles of that salt being mechanically carried off with the steam. But the author states that the result of his investigation is the dissociation of the nitric acid, and consequently the formation of caustic potassa, which is actually found in the solution.—*Ibid.*

761. Dubious; in Fact, Highly So.—The transportation of crude petroleum, and particularly of the lighter portions of it, such as benzine, gasoline, etc., is attended with heavy loss from evaporation, in ordinary packages, and a substitute for barrels has long been looked for by the trade. It is now proposed to make barrels of glass, sufficiently thick for transportation.

762. Gasholders.—A "reliable" public print tells us that Providence, R. I., has a large gasometer (*sic*) and the papers of that city are confident its dome is the largest in the world; it being 140 feet in diameter, or one foot larger than the dome of St. Peter's at Rome. It holds above the top of the tank 1,540,000 cubic feet.

[What shall we say then of that at the Hackney Road Station, London; 200 by 80 feet, and holding 2,500,000 feet.—Ed.]

763. Coal-Tar.—Not many years ago coal tar, obtained from the distillation of coal in making gas, was considered a nuisance and gas companies ran it into the rivers. Now the chemist makes from it about 56 of the most magnificent colors. The Philadelphia gas company is making arrangements for mining it from the bottom of the river, into which they have thrown about $150,000 worth.—*Prof. Chandler.*

764. Hydrothermic Engine.—D. Tommasi.—From the short account here published it would appear that the author has constructed a mechanism, the motive power of which is derived from the expansion of oil by heat. A more complete description is promised shortly; but this contrivance seems to offer great advantages over steam, inasmuch as—(1) no explosions of boilers can take place; (2) 80 per cent. less space is required for the apparatus; (3) cheapness; (4) economy of fuel.—*Les Mondes.*

765. Artificial Production of Ice.—Giffard and Armengaud.—With the machinery as now contsructed, and as yet imperfect, the authors have succeeded in making 20 kilos. of ice per minute while working with a 5-horse power high pressure engine, so economically constructed that for 1 kilo of fuel used, 2 kilos. of ice are obtained.—*Les Mondes.*

766. The Catoptric Lamp.—The upper part of Trafalgar square is now lighted with some of the "Catoptric" lamps recently shown before the Society by Mr. Skelton, the inventor. The improvement is very decided, and the difference in the illumination of the street will be obvious to those who remember its former darkness.—*Jour. Society of Arts.*

767. Aniline.—M. Langerrois has found that putrefaction and decomposition of animal matters can be prevented, even when exposed to the air and in an elevated temperature, by the use of small quantities of aniline.—*Medical Press and Circular.*

768. The Academy of Sciences at Paris have awarded their prize of $10,000 to Mr. Gramme for his electro-magnetic machine, which is one of the simplest and most efficient that has yet been invented. The construction is so free from complications that the instrument will work and give a continuous current for months together, and to those who know anything of the subject, these will appear as results of the highest importance. One of the uses to which this machine may be immediately applied is the production of a light of intense brilliancy, which will be seen farther than any other electric light yet known. One of the French steamship companies is about to use this light on their vessels as a precaution against collisions or other casualities, and it is obvious it can be made of great general utility.—*Exchange.*

769. Lignite from Louisiana.—Brown coal, of which there are considerable deposits in the banks of the Mississippi River, about two miles below Shreveport, in Louisiana, has been recently proposed as fuel for steamboats on the rivers. Analyses of air-dried specimens, representing these deposits, have yielded the following average results:

One hundred parts contained:

Water	15·26
Volatile matter (bituminous)	41·30
Fixed carbon (coke)	37·55
Sulphur (merest traces)	
Ash	5·89

This lignite has a specific gravity of 1·143, it is nearly black in color, and its ligneous structure is not so distinct as usual, but it dissolves completely in caustic soda solution.—*S. Dana Hayes—American Chemist*

770. Glasgow Water-Supply.—The quantity of water sent into the city and district during January, February, and March last averaged 25,600,000 gallons a day from the Loch Katrine works, and four million gallons from the Gorbals works—in all, 29,600,000 gallons a day, or nearly two million gallons a day less than during the corresponding three months of 1872. There always is a falling off in the consumption of water during the winter months; but the diminution since last summer, when it reached 33,500,000 gallons a day, is very marked, and must, I think, be partly due to the representations which were then made that the works would be speedily exhausted if the rate of increase in consumption was maintained which had prevailed for some years. It may also be partly due to the staff of inspectors of water fittings having been considerably increased.—*London Mining Journal.*

771. New Method of Exhibiting the Carbon Poles.—Mr. S. H. Landy of Columbia College, New York city, has succeeded in effecting a decided improvement in projecting the carbon poles upon the screen. The old manner of showing them is to place them behind the condenser in the interior of the lantern, and then throw them upon the screen, giving but a faint and confused image. Mr. Landy's method is to place them in front of the condenser (a sufficient distance to avoid injuring the glass, about an inch); and then, by using an ordinary objective, they are thrown upon the screen greatly magnified and clearly defined. The electric current is then established, the carbon poles are drawn apart and we have a magnified arch of about eight inches, making visible to an audience the transfer of the incandescent carbon from the positive to the negative pole. By placing caustic potash upon the positive carbon, the arch is greatly extended; by the use of thallium, silver, or copper, the characteristic color of each element is gorgeously depicted upon the screen, making altogether a most beautiful and instructive experiment.—*Scientific American.*

772. Deep-Sea Soundings.—An instrument for dee

sea sounding was invented by Sidney E. and G. L. Morse, brother and nephew of the late Prof. S. F. B. Morse, patented here in 1866. This machine consists of a rod containing a series of hollow glass balls, by means whereof, the number of balls being increased or diminished, any desired degree of buoyancy may be imparted to the instrument. Bags of sand or stones are attached, by which the rod is carried down and the lower end made to scoop up a portion of the ocean bottom. The sand bags become detached when the rod strikes bottom, and the rod then rises with amazing velocity to the surface, shooting up into the air as if discharged from a gun. This instrument is also provided with glass pressure chambers, and mercury, so arranged that the pressure of the water will drive the mercury from one chamber into the other. The depth of the ocean bottom will be indicated by the quantity of mercury so exchanged. The register of depth is very exact. This sounding instrument requires no line, and is, we believe, the first of the kind ever invented.—*Scientific American.*

773. The Walls of Aquaria, exposed to light, become covered with a growth of cryptogamous vegetation. M. Charbonnier has observed that sometimes two or three days are sufficient for the full growth of this green moss, while at other times, it hardly appeared in eight or ten days. He has noticed that every month, at the time of full moon, the vegetation has its maximum of intensity, and it is almost *nil* at new moon. At full moon a daily cleaning is needed; whereas, this period over, cleaning twice a week will be sufficient. M. Charbonnier has also made observations on the germs of microscopic confervae in water coming to his reservoirs from the Ourcq, in Paris. This water passes a considerable distance in the open air. Now, the quantity of these germs is found to be very variable, and it is greatest at the time of full moon. The explanation he suggests for such a curious phenomenon, is as follows:

Vegetable germs lying at the bottom of a stream are raised in sunlight by the gas bubbles; they then give off in respiration, and which continue some time attached to them. When night comes on, the bubbles disappear, and the plants sink again; but if there is strong moonlight the production of gas continues, and they are kept floating; hence the superabundance met with at full moon.—*Am. Artisan.*

774. At a Recent Meeting of one of the British engineering societies, some facts of a special character were adduced in support of the opinion that the limit of advantage, in the use of high-pressure in expansion, is reached at about forty pounds per square inch, and that any increase of pressure beyond that is useless, and consequently, for various obvious reasons, disadvantageous. The statements made did not, it is reported, appear either clear or conclusive, and were not indorsed by the meeting. It was admitted that about 60 pounds' pressure is the present practical limit employed, but no very distinct reason was assigned for stopping there, except that the makers had found by experience what they could do with that pressure, and felt safe in its use. Among other statements made, bearing on the question discussed, was that by several speakers—namely, that the double cylinder engine contained elements admitting of the boiler presssure being pushed further than with the single-cylinder engine, and it was stated by an eminent Liverpool maker that 60 pounds' pressure is not the limit of pressure, either theoretically or practically.—*Iron Age.*

775. Paint on Wrought Iron Plates.—This matter has been carefully investigated under the auspices of the Dutch State Railways, and the result was brought before the Society of Dutch Engineers by Van Diesen. Of 32 plates, half the number were plunged in diluted hydrochloric acid for 24 hours, then neutralized with lime (slaked), rinsed in hot water and, while warm, rubbed with oil; the other half were mechanically cleaned by means of scraping and brushing. Four plates of each kind were then prepared with one coat of red lead, two sorts of oxide of iron, and coal tar. This was done at Harkort's works in July, 1867. The plates were then exposed to the influence of the weather for a period of three years and re-examined, when it was found:

1st. That the coating of red lead had stood well on plates of either method of preparation, therefore in this case no preference could be assigned.

2d. That oxide of iron, by Kampand Soeten, gave better results on plates cleaned chemically than on those cleaned mechanically, the coat on the former being in as good a state of preservation as the red lead.

3d. That oxide of iron by Anderghem gives as good results on plates cleaned chemically as the two previous materials, but is inferior to them if applied to scrubbed surfaces.

4th. That coal tar is much inferior to any of the preceding; from scrubbed surfaces it had almost entirely disappeared.—*Iron.*

776. Blue Dye Derived from Carbolic Acid.—The carbolic acid is mixed with eight or ten parts stannate of soda, to which is immediately added concentrated sulphuric or hydrochloric acid. By using the former, a yellow substance is obtained, soluble in tartrate of soda and in the alkalies. By the addition of a large proportion of acid the mixture becomes reddish brown and all the carbolic acid dissolves. Combined with a large amount of water, the solution becomes red, and brown flakes, soluble in alcohol, are deposited.

These flakes give to alkalies a blue coloring matter, which is not precipitated either by water or alcohol. It has not been isolated, except on the fabric. The red watery solution treated with alkalies become green on account of the formation of the blue dye and a yellow substance. If a fabric of oiled cotton be plunged therein, it is rapidly colored orange, which tint, like the liquid, passes to green when acted upon with alkalies; but if the dyed material be finally left to the action of water, it becomes a sky blue, which is almost unalterable by chlorine and the hypochlorites.—*Sci. Am.*

Gas Tribulations Over the Water.

Our contemporary "*Iron*," is "hard" on the gas companies. It is to be remembered, however, in possible extenuation of this severity, that *ten per cent.* is deemed a great profit upon an investment in Great Britain proportionally much greater than with us. We quote:

"Lord Redesdale is a difficult man to get over. Railway, gas, and other companies ought to have found this out by this time, and have learned to appreciate his lordship at his just value. Several gas companies are endeavoring to obtain parliamentary powers for a permanent increase in their *maximum* charges. The sudden rise of coal during the last twelve months has been made the pretext for this application. Lord Redesdale is opposed to any concession to the companies, and, like a true man of business, refuses to believe that the rise in the price of coal has yet affected companies who enjoy the advantage of having long ago made contracts for a supply of coal. Important concessions have been granted—on certain conditions—to the existing gas companies, but the moment they find their profit dropping below the *maximum* 10 per cent. allowed them they raise a howl of discontent. They omit to consider that a virtual monopoly has been granted them on the condition that they shall not make more than 10 per cent. profit. Like other speculators, they must take the chance of working for a while without dividends; when, if it be proved that the rise in the price of coal is permanent, there is little doubt that the Legislature will be ready to relieve its pampered children from the weight of their bonds. Meanwhile, London is one of the worst lighted cities in the world."

Brooklyn's Gas Problem.

A Special Committee of the Brooklyn Common Council held its first meeting, Friday May 30th, for the purpose of taking into consideration the advisability of the city manufacturing its own gas. Alderman Taylor, Chairman of the Committee, had requested the presidents of several of the city gas companies to appear, and there were present G. W. Benson and V. T. Hall of the Brooklyn Company, and W. P. Libby of the Citizens' Company. Mr. Benson stated that his company, when it was first started, supplied the whole city. This was in 1849. Afterward it sold portions of the district to other companies. The price per thousand feet charged consumers at the outset was $4, and just before the war $2.50. There are 300 stockholders in the Company, and the market price of stock at present is $237. He believed that gas could be manufactured for $3 per thousand feet. The first dividend paid by the company was 3½ per cent. The annual manufacture by his company is 400,000,000 feet. The coal used is Ritchie mineral, which is superior to English coal. He was asked if Judge McCue had not offered $250 dollars for the company's stock, but answered that he did not think the Judge had.

Mr. Libby stated that the Citizens' company owned the district lying south of Atlantic and Flatbush aves., and extending from the river to the city line. They purchased the district from the Brooklyn company, paying $150,000 for it. The company started in 1859, and the capital stock ($1,000,000) was all paid in them. The cost of the works was $75,000. The monthly pay-roll is about $6,000, and the labor costs about as much as the coal. They made their first dividend (six per cent. per annum) in 1862, and the price gradually rose until last year 15 per cent. was paid. The company uses naphtha in its manufacture of gas, and furnished a quality equal to 18 candles. The minimum cost of the gas manufactured by the company last year was from $2.04 to $2.10. In 1872 they sold one-third of their district to the Metropolitan Company of which Judge McCue is President, for $200,000 in money, and $200,000 in stock. The company's stock sold in the market at $200, and that at a slow sale. The annual manufacture is about 180,000,000 feet. From 8,000 to 10,000 feet is obtained from a ton of coal. He asserted that about 25 cents on every 100 feet of gas manufactured goes to the city for taxes, and that about 10 per cent. is waste. The company had also sold a portion of its district to the People's Company for $500,000, and Nassau for $100,000. He also remarked that he answered some of the questions put to him because there seemed to be so much public misunderstanding regarding the cost of manufacturing gas and the profits arising from the same.

There are six gas companies supplying the city with gas, and the price charged the people and city is $3.25 per 1,000 feet. The companies are the Brooklyn, Citizens', Metropolitan, Nassau, People's, and Williamsburgh. Mr. Libby is President of the Peoples' Company as well as the Citizens'. Alderman Taylor believes that the city can do much better than under the present arrangement, and will advocate the adoption of the plan so successfully and economically carried out in Philadelphia. The committee will sit again. —*Brooklyn Daily Eagle.*

The Manufacture of Fire Brick, Gas Retorts, Tilings, Etc.

One of the earliest industries recorded in history was the conversion of clay into bricks, which were dried in the sun and extensively used for building purposes. Notwithstanding the rude processes of primitive ages, their manufactures in this line possessed wonderful durability, as is evident from the remains of ancient masonry, dating far beyond the Christian era, and apparently almost indestructible.

In modern days the manufacture of fire bricks has resulted in the production of an article which will for a long time withstand the fiercest heat of blast furna-

ces, foundries, ovens, kilns, etc. In the United States there have been discovered large deposits of clay suitable for this manufacture, and there are probably no better firebrick made anywhere than those which are produced at our leading establishments of this description.

We believe that one of the most extensive concerns of the kind in this country is the old established house of B. Kreischer & Son, whose works are located at No. 58 Goerck street (corner of Delancy), New York. The business was established in the year 1845 by Balthazar Kreischer—the senior member of the present house—and Charles Mumpeton. After the decease of the latter in 1849 Mr. Kreischer became sole owner of the works. His son became interested in the business in the year 1872, when the present style of B. Kreischer & Son was adopted.

In 1854 Mr. Kreischer purchased a large clay property at Westfield, Richmond county, Staten Island, and erected extensive works for the manufacture of fire brick and gas retorts. Quite a village gradually grew up around the establishment, a post office was located there, and the place was called Kreischerville, in honor of its founder.

The clay beds cover about 15 acres of ground, located quite near the shore, and including valuable wharf property. There are four immense kilns, three of which have a capacity for 50,000 bricks, or 50 retorts each; the other for 35,000. Some 75 hands are constantly employed, aided by steam power and machinery of the latest improved construction. Recent additions have been made to these works, including a new building, 150 by 275 feet in dimension, expressly devoted to the manufacture of clay retorts for the use of gas houses. The monthly consumption of coal is 150 tons of anthracite and 60 tons of bituminous.

In addition to the Staten Island clay beds, the firm also own 26 acres of clay grounds in Woodbridge, New Jersey, a locality long celebrated for the superior quality of its clay deposits. Here they employ about 50 hands in the excavation of the clay, and in its transportation to the shipping point, about two miles distant, whence it is conveyed to New York by schooners and canal boats belonging to the firm.

The New York Works occupy the space of thirteen city lots, with a frontage of 300 feet on Goerck street and 150 feet on Delancy street. The entire area is covered with substantial brick buildings, two and three stories in height. The immense chimney, towering to an altitude of 120 feet, is a conspicuous landmark in the eastern section of the city.

The main kiln is one of Hoffman's patent, oblong in shape, divided into compartments, and capable of holding 150,000 fire brick. The compartments are filled and heated in regular succession, one being filled and one emptied each day. This is, we believe, the largest kiln in use in this country, and the only one of the kind of anything like such huge dimensions. There are also three square kilns, of the B. Kreischer patent, with a combined capacity for burning 48,000 brick.

For heating these kilns and driving the engine—of 50 horse power—and other machinery, the monthly consumption of anthracite coal is 200 tons: of soft coal 40 tons. About 75 hands are employed and 12 horses are constantly engaged in the transportation of materials and merchandise. The establishment is supplied with four steam elevators, and the machinery for preparing the clay includes two large "pug mills," or clay mills, and two immense revolving wheels of the old fashioned pattern.

The clay is first elevated to the second story, carried on a railway, and discharged into large bins upon the first floor, the various qualities being carefully separated. After mixture with water in large vats, the clay is run through the pug mills and ground to an even consistency. From the mills it emerges in a continuous mass, which is broken by the workmen into large lumps. These are placed upon endless belting, which conveys them to the upper floor, where they are roughly fashioned into brick by means of iron moulds and presses.

At this establishment every description of brick is manufactured for the use of rolling mills, blast furnaces, forges, foundries, gas works, lime and cement kilns, cupolas, steel and iron works generally; also slabs and tiles for flooring of bakers' ovens, linings for stoves, etc. Any particular size or shape that may be desired is made to order from drawings or dimensions in figures, and the same uniform quality is maintained in all instances. Especial attention is bestowed upon the manufacture of fire brick for rolling mills and all establishments where a very high heat is required, and the reputation gained by the firm in this department of their business is not surpassed by that of any similar concern in the country.

The senior partner has devoted many years to the examination of the best methods in use, both here and in Europe, and has devised many valuable improvements in the practical working of the machinery used in this manufacture. It is now, we believe, generally conceded that the combined works belonging to this firm exceed in their amount of production any other establishment of the kind in the United States, while the character of their goods is second to none in the market.

The Drummond Colliery Fire.

The following concise account of this fire-damp disaster we owe to the *Engineering and Mining Journal*:

A dreadful disaster in the Drummond Colliery, Pictou county, Nova Scotia, comes as a new warning to managers of mines. Work had been suspended for some time to settle certain disputes with the workmen, but was resumed May 13. There must have been a large accumulation of gas, for at half-past 11 in the morning, a shot fired in one of the upper levels, ignited the gas and a severe explosion was the consequence. The fire seems to have spread with great rapidity, and the lists of the killed contain the names of 48 men, while six others are wounded, some fatally. It is reported that these, or some of them could have escaped, but, remaining to fight the fire, they became the victims of a second explosion, which took place at 2 o'clock. The accumulation of gas was so great that the flames are reported to have risen 100 feet in the air, and explosions followed each other in rapid succession for many hours.

The daily press is laying great stress upon the fact that the mine had but one hoisting shaft, though the reports all speak of an air shaft which appears to have been in good order. The true cause of the disaster was the incautious resumption of work after a stoppage. The mine is known to be very fiery, and though the manager is reported to have been careful about his ventilation, it is evident that he was not careful enough. The fragmentary reports received from the coroner's inquest lay the burden of the mishap upon special occurrences rather than general conditions. The Inspector of Mines, for instance, is reported to think that "the direct cause was in not exercising proper care in firing shots in the bench. The first two were merely blown out, causing fissures in the body of coal where gas accumulated. When the third shot was fired the coal ignited, and all attempts then to quench the flames were unavailable." However that may be, it is evident that the laws should require more care in starting mines which have been closed. It is well known that a large part of the accidents occur on Mondays, and at other times immediately after rest. The circumstances rank the present occurrence in the same category, and there is no doubt that the requirements of the law, relating to the resumption of work, after a stoppage, should be increased.

In this connection, the following, from a late issue of the *Mining and Scientific Press*, is worthy of attentive consideration:

The uncertainty of the causes of many fatal explosions in collieries has led to investigations of the subject in all its phases, of which "explosions from blown out blasts" is one. The Midland Institute of Mining Engineers in England is now engaged in discussing the important question, according to the London *Mining Journal* and a well known English Mining Engineer has published a paper on the subject.

It was formerly contended and is by some now, that before an explosion can take plaee there must be another important contributor—the presence of gas, fire damp or "light carburetted hydrogen gas." Yet many explosions have taken place in coal mines where this gas did not previously exist, and the causes are still shrouded in mystery. The causes of a number of fatal explosions are, however, accounted for by the peculiarity of "blown out shots" hereinafter explained.

The exhaustive paper to which we refer seems to intimate that the explosions took place almost immediately after the shot was blown out, but in the case of the Manzanita Claim, according to the dispatch, it was a full hour before the men entered the claim, and a light was brought in. In a number of cases cited by Mr. Warburton in his paper, it was clearly proven that explosions occurred in the mines after "blown out shots," in places where there was previously no gas.

In one instance mentioned, when the shot was blown out, it was at a great distance from where there was any explosive gas, but in about the space of time necessary to count two, the explosion occurred. Of course the powder exerted its force somowhere, and Mr. Warburton explains the matter as follows: The powder put in the hole was considerable; the amount of force it would exert is difficult of calculation. Of one thing there was no doubt, from the loud report and its consequences, a very small proportion of the energy of the powder was spent in the rock. Some idea of the force of powder may be gathered from recent experiments. When under pressure it was found to be equal to a force of nearly 16 tons on the square inch of the hole containing the charge. As this force was not spent in the hole, where was it spent? On the atmosphere of the mine. When the ignition of a pound of powder in a cannon will send a ball of seven pounds weight, say 1,800 yards, and at the mouth of the cannon at the rate of 1,467 feet per second, what must be the force of this powder striking the atmosphere? It would strike with the force of many tons.

What would be the force on the atmosphere of the mine in the vicinity of this blown out shot. Suppose we consider it pretty nearly good atmosphere, composed of a due proportion of oxygen and nitrogen, with a small proportion of carburetted hydrogen. This strong, quick blow, would set at naught the law of the diffusion of gases. The atoms of each separate gas would set off at different velocities, according to its specific gravity—the lighter at a speed far quicker those of greater gravity. Another law might increase the velocity of the carburetted hydrogen—that of absorption as it is very high in this gas, being per 100—air 1; carburetted hydrogen about 400; so it is more than possible the velocity of the atoms of this gas would be greatly augmented by the heat absorbed from the flame of the powder. The atomic velocities according to gravities at atmospheric pressure at a temperature of 32° F. have been ascertained to be nearly as follows:

Oxygen	1513	feet per second.
Nitrogen	1616	" " "
Carbon	1885	" " "
Hydrogen	6050	" " "

This is the difference of velocity at a pressure of 15 lbs., and would be much greater under the pressure given by the force of the exploded powder, enough perhaps to account for the aggregation of sufficient atoms of carbon and hydrogen to bring the atmosphere up to an explosive point, where, previous to the sudden transmission of the atoms of carbon and hydrogen, it was not so.

These are the very interesting points argued by Mr. Warburton on the question of "Explosion from blown out shots." He concludes that if these impressions be confirmed by investigation, it will be dangerous to use powder even in collieries not supposed to give off large quantities of gas, and in all collieries it is a power to be used with care, and in the hands of competent men.

[The Editor of this Journal desires to say that he is not satisfied with the reasoning set forth above.]

The Cincinnati Gas Works.—A correspondent of the New York *Daily Times*, writing of the fire that occurred in Cincinnati on the 8th inst. says: Sixty feet distant, directly across Second street, were three immense iron receivers of the gas works. The gas company kept ten men on top of the tanks with hose throwing water on the heated iron. These receivers on the side next to the fire were red hot, and were momentarily in danger of explosion, an event which would have been certain death to the men on top. The firemen did all that the intense heat would permit, but the men at last had to forsake the gasholders. By this time the coal oil had all burned out, and the lumber yards and burning dwellings remained to be extinguished. The fire department soon got control of the fire, and the gas receivers were out of danger. The heat was so intense as to fracture the stone border of the gas tanks.

Chemical and Sanitary Report upon the Passaic River.

By Prof. Henry Wurtz.

To the President and Commissioners of the Board of Public Works, of Jersey City.

[Concluded from page 186.]

REMARKS UPON AERATION OF POTABLE WATERS.

It will probably not be expected that space should be occupied with authorities, quoted in support of the proposition, that a necessary condition of a healthy water is good aeration. The universal experience of mankind has taught them this. A well or an underground cistern may be deprived of light (indeed the less light the better), but *air* it must have, or it putrefies in spite of all.

Dr. Letheby has recently produced facts to show that the death-rates of British towns are proportional to the absence of the earthy bases from the water supply: and has argued that these bases are needed for the making of blood, bones, etc. His facts are undeniable, but the present writer has a very different explanation to suggest, namely, that these bases are needed by oxygen in its work of nitrification and destruction of putrefactive matter, an explanation which seems far more satisfactory.

Early in this investigation, when your reporter first began to see the nature of the process going on in the Passaic waters, the immediate necessity forced itself upon him of possessing reliable methods of determining the amount and rate of aeration of water. On trying the methods heretofore in use, they were found far from reliable or delicate enough for the purposes required. He therefore cast about him for new means, and in the course of time and experiment settled upon a reagent introduced long since by Liebig, for determining oxygen in the air, and widely used in gas analysis, called *pyrogallic acid*. (As it is not an acid, it it is preferable to follow some of the English chemists, and call it *pyrogalline*.) The details of the methods that have been founded on the use of this agent in water analysis must be reserved for communication to the chemical world in another form. Great difficulties were met with in the practical application, but have been satisfactorily overcome. It furnishes now the means not only of determining the amount of oxygen already existing in the water, but also of determining the rate of its absorption by different waters, and under different circumstances.

By means of these tests, it will be possible, if deemed desirable by your Honorable Board, to examine into the merits of any plans that may be proposed for improving the quality of your present water supply, and avoiding the troubles that have arisen.

Considerations in reference to new sources of water supply, or new modes of supply, are not within the province of this report; but it may be considered as pertinent for your reporter to submit to your Board any views looking towards improvements of and making the best of the present supply, and mode of supply; premising, however, with emphasis, that these are only intended to be regarded as *suggestions*, which, by awakening attention to the subject, may possibly give rise to far better and more practicable plans.

Now, that we are acquainted with the nature of the wonderful process of regeneration and revivification that goes on in our water, it behooves us, in fact, if within our power, to promote it: to assist nature, and to study the means of doing so, without delay. What conditions then, should we supply to the water, in order to promote this process? Evidently two, Oxygen and Time; or, as it may be better to express it, opportunity to absorb oxygen, and time for the oxygen to do its work.

One suggestion to be thrown out here, amounts simply to this; that, if means were adopted to keep the water in one of your reservoirs in a condition of gentle agitation, or rather intestinal motion, in every part, so as continually to turn up new surfaces to the air, the absorption of oxygen would be enormously promoted. To support this assertion, it may be stated that by the new method, the water taken from the receiving reservoir on the 10th of October last, was found, when standing *at rest*, at 60°, to absorb oxygen from the air in 12 hours to the depth of 4.75 inches, and in 24 hours to the depth of but 7.5 inches. After this, the absorption became very slow, and in two days almost imperceptible. The motive power for keeping the reservoir water in motion would be trifling, and readily obtainable from the inflowing water.

The immediate objection made will be that one function of the reservoirs is to cause the water to *settle* and deposit its sediment; and that motion will interfere with this. This is by no means certain, as there are reasons that have led your reporter to the opinion that thorough aeration will tend to promote separation of the sediment; but, be this as it may, it is very probable, from the analytical results presented in this report, that little or no settling is actually accomplished, in your distributing reservoir at least. The water from the receiving reservoir of October 10th gave 0.479 of sediment, while that from the hydrant in Hoboken of November 1, gave 0.493. The latter result agrees also with that of Prof. Chandler, who found, in hydrant water of May 3d, 0.520 of sediment. One reservoir might, at present, be sufficient for settling purposes.*

As said before, however, this novel idea is at present thrown out merely as a suggestion, to be considered by your Board, in case you decide to adopt temporary expedients. Its applicability would of course be greatest during those seasons when the reservoirs, lying in hot still sunshine for whole days together, are obviously in the condition, more than any other, of stagnating pools, in whose bosoms all kinds of organic changes, including putrefaction (in the absence of abundant oxygen), as well as germination, may well be believed to find most favorable conditions.

Still another suggestion, also of a very simple character, which ought to have considerable efficiency for a time, is to remove, not your pumping works, but the point from which you take the water from the river, some miles further away from Newark, leading it of course to the works by a canal.

PREVIOUS ANALYSES OF PASSAIC WATER.

The suggestion was made by one of your Honorable Board, when this investigation was projected, that it would furnish us the means of determining what changes have taken place, if any, in the Passaic water since the analysis of Prof. Horsford, twenty-one years since.

With regard to some of the constituents, something of this kind may be done. Prof. H. states his sample to have been taken at Belleville, at high tide, in October, 1851. It should therefore be appropriately compared with our high tide sample, when calculated to the same standard, the U. S. gallon of 58,327.5 grains. The following is a comparison of some of his determinations, of the most important constituents, thus calculated:

	Horsford, '81.	H. Wurtz, '72.
Sulphuric Acid	0.834	0.776
Lime	1.163	1.197
Magnesia	0.578	0.493
Chlorine	2.125	0.292
Soda	1.838	0.420
Total Residue	7.437	4.783
Ash	4.579	2.887

The correspondence in the case of the first three constituents is close, but when we come to the chlorine and soda, we find an immense preponderance of both of these at the time of Prof. Horsford's analysis, and nearly in the ratio in which they form chloride of sodium. It is this excess of common salt in his sample which must also be understood as so largely increasing the total residue and the ash. Upon the cause of this difference, with so few data, it is useless to speculate. Prof. H. also found no phosphoric acid, although he does not seem to have used the delicate molybdate of ammonia test. This, however, I think was scarcely known or understood clearly at that time. Nitric acid, in the proportions we have to deal with in this water, could scarce have been detected at all at that time. As for ammonia, we have accounts several years later than this (in 1855, but 18 years since), of English analysts boiling down fifty imperial gallons of Thames water at a time to determine it! We can now do this, by our microchemical methods, with more certainty, and in twenty-four hours' time, or less, in half a pint of water. Such strides is water analysis now making. Prof. Horsford, I may here add, of course knew, as it was well known at that day, that metals, or rather nascent hydrogen, converts nitric acid into ammonia, susceptible of precipitation and weighing; and if he could have procured Passaic water by the barrel, and operated on a manufacturing scale, occupying a long period of time, I doubt not he would have determined the nitric acid also. A bbl. of *the present* high-tide water, thus treated, would have given him just four and a quarter grains of ammonia, representing 13.5 grains of nitric acid. In those days doubtless much less, as the Passaic basin is now much more populated.

The reason for dwelling on these points is the desire to impress upon your Honorable Board the consideration that the truth in this line of research, cannot be arrived at without care, skill, time, and labor; and, as in all other human pursuits, the result is very likely to be valuable in proportion to the amount of these expended. Your reporter seeks thus to justify himself for the length of time he has consumed in this research.

Hearing that Prof. Cooke, the present Director of the State Geological Survey, had made some examinations of the water four or five years since, the undersigned wrote him a letter of inquiry and received a reply, which he does not feel at liberty to reproduce here, but it was briefly to the effect that he (Prof. Cooke) did examine the water for nitrogenous or other organic matter, but unsuccessfully so far as their detection went, and that he had not retained the notes of his results.

Recently, the writer's friend, Prof. Chandler, was kind enough to communicate to him, and place wholly at his service, the results of a partial analysis of hydrant water made by himself nearly a year ago, with the object of illustrating a popular lecture on water, delivered by him in Hoboken. The water was taken May 3, 1872, but there has been no opportunity to inquire into the condition of the river at that date. May is, however, usually the most flooded month of all. For comparison, the figures of column 5 of table II. are put beside such of Prof. Chandler's as can be compared therewith; though in reality the two analyses, besides the difference of season, are not strictly comparable, for the reason that Prof. C. made his upon the settled water, whereas column 5 was obtained with a view to get the *average* winter composition of the water, as generally used, without settling or filtering.

	H. Wurtz, Dec. '72 & Jan. '73	Chandler, May 3, 1872.
Sulphuric Acid	.2012	.200
Nitric Acid	.2800	
Carbonic Acid	.2880	
Chlorine	.1520	.207
Phosphoric Acid	.1202	
Silica	.6344	.775
Lime	.8037	.660
Magnesia	.3950	.134
Potash	.1375	.075
Soda	.2730	.180
Ammonia	.0050	
Peroxide of Iron	.0699	traces.
Alumina	.0868	
Total Residue	4.1070	4.905
Ash	2.9090	3.739
Sediment		.520

Except the general conclusion that times and seasons vary greatly the mineral constituents in the Passaic water, few special points of interest are brought out with sufficient clearness by these few analyses. One or two, however, seem plain enough, particularly if we refer back again to Prof. Horsford's results. One is, that the sulphuric acid is probably three times larger in the fall than in the winter and spring.

This is readily explained on considering the source of the sulphuric acid, which is the oxidation of iron pyrites in the pores and fissures of the rocks of the Highlands. When these fissures are chiefly filled with ice and the water is cold, this action is checked. Another probable point is that in winter and spring the amount of lime in the water is less, though this may be due to flooding.

Too few analyses have been made, and at too few seasons of the year, to allow of useful comparisons.

THE PASSAIC WATER-SHED.

Not being able to find any data for the computation of the flow of the Passaic River, it was determined to make a careful measurement of its water-shed, or basin, which was accomplished by the method of weighing.

Three sections of the large geological map of the State were found, on being pieced together carefully,

* Since the above was written it was found, as stated on a previous page, that the sediment yielded by the sample from the reservoir consisted partly of a vegetable growth. More analyses would be required to determine the question of the actual effectiveness of the supposed settling operation in these reservoirs.

to cover all but a very trifling corner of the water-shed, at the head-waters of Saddle River. The wonderfully tortuous rim of the basin was now very carefully traced out all round, following a medial line between the heads of the small tributaries and those of the adjoining basins, using a soft pencil. Tracing muslin of the best quality was now superposed, and the former line followed round again. Small sharp scissors were now called into requisition, the water-shed cut out, carefully rolled up, and weighed on a delicate chemical balance. One hundred and twenty square inches of the same muslin were then carefully measured out, cut out in the same way and also weighed. As the scale of the map is two miles to the inch, this represents 480 square miles. The weight of this and of the whole water-shed being known, it becomes a simple rule-of-three sum.

Two such maps were made. One, on which I endeavored roughly to trace out the river and its main tributaries, I present herewith, that you may be enabled to inspect the form of this singular basin. On the other were traced out, before detaching it, the boundaries of the different geological formations that are included within the basin, also the State-line between New Jersey and New York. This latter map was dissected, and weighed piecemeal, to determine these different areas.

The following are the figures obtained:

Area of Passaic water-shed.....	908	square miles
Area of the New York portion thereof.....	148.5	" "
Area of the crystalline rocks of the Highlands, within the water-shed.....	484.5	" "
Area of the Brown "Sandstone," and Trap (Triassic) formations	423.5	" "

[It was the original intention to enter into some geological, or rather lithological discussion, based on these measurements, and the bearing of the results of the analyses upon the composition of the rocks, the more especially as your reporter has spent much of his life in the study of the rocks, minerals and general geology of northern New Jersey. It was intended to calculate the rainfall in the basin for each month in the year, and other interesting matters besides; but it is now feared that the necessary limits of this report would be surpassed.]

The water-shed of the Passaic, it thus appears, is much larger than had been anticipated, and it is evident that the estimates heretofore accepted, of the average flow of this stream, are greatly below the truth. The annual rainfall is known to be more than 50 inches,* and a simple calculation shows, therefore, that the total amount of water received by the Passaic and its tributaries in one year, is 782,100,500,000 gallons, or 2,115,000,000 gallons per day, on an average. As it is usual to allow a loss of one half, however, by evaporation, it will be safe to call the average daily flow of the Passaic one thousand million gallons. This is not much less than the average assigned to the River Thames, 1,350,000,000 gallons; although that river is more than 250 miles long and ours but eighty miles. This fact serves to illustrate the very remarkable character of the Passaic basin. The rainfall, however, in the Thames valley is but 27 inches. The Croton water-shed measures 339 square miles, so that our water-shed is 2.7 times the size of that which supplies New York city. Nine-tenths of this water-shed lies above Paterson, and its drainage flows over the falls at that place. We have water enough (with reservoirs of sufficient capacity and in proper locations) for all our cities for centuries to come, not only for domestic, steam and manufacturing uses, but even for water-power, where small powers are required (as for sewing-machines for example). This problem is, how to make it come to our cities without constantly augmenting cost. This, however, is a matter outside the scope of the present report.

THE SEWAGE OF PATERSON.

Included in the instructions upon which this investigation was based, were examinations into the question that has caused alarm to some, whether the Passaic water is not possibly contaminated, and rendered poisonous, by mineral and metallic poisons, discharged from the dye-works in which chemicals are employed, in Paterson.

It is among chemists an accepted fact, that no such substances are thrown by manufacturing cities into rivers, in any *permanent* form of solution; but, as many who use our water would be much better satisfied with direct chemical evidence on this head, as much time was spent in these examinations as could be reasonably taken from things of greater profit. Visits were made to a number of these works, and it was ascertained that there was a possibility of small quantities of waste lead and copper solutions finding their way into the drains. The aniline colors, some of which, it has been suggested, might carry *arsenic* into the river, were stated to be too costly to allow of any waste. They are always used up entirely. It has been stated on a previous pages that samples were taken from two of the main sewers, and from the river below all the sewers at the Straight street bridge. All these, though kept in a room without fire, tightly stoppered, and in very cold weather, began straightway to putrefy, and to evolve free sulphuretted hydrogen. As neither lead, copper, nor arsenic can remain in solution for a moment in water containing sulphuretted hydrogen, this was pretty conclusive; yet it was deemed best to make a crucial experiment. To a portion of each water was *added* small quantities of solutions of lead, copper, and arsenic. After settling for 34 hours, the filtered liquids were rigidly tested, and no trace of either of these three metals could be found left in solution.

It should be added, for the behoof of chemists, that all these samples were absolutely neutral to test papers; a somewhat surprising fact, when it is stated that the samples were collected on a *washing day* (Tuesday, from 2.30 to 3,30 p. m.), and it was expected that they would be perceptibly affected by the alkali of the soap. The amount of sediments deposited by these samples respectively, after standing at rest one month, were as follows:

Water.	Quantity employed.	Grs. of dry sediment per U. S. gallon.
River from Straight street bridge.....	530 grammes	1.101
Prospect street sewer.....	578 "	2.119
Paterson street sewer.....	680 "	10.294

It had been intended to report other analytical results obtained in connection with the sewers, but as the above comprise all that have any *obvious* sanitary bearing, it is judged better not to swell the report with them.

Some microscopic observations were made on the above sediments, but nothing observed of much interest, except the somewhat curious fact that the river water taken from the Straight street bridge gave a sediment singularly crowded with fragments of *fibres* of various kinds, derived apparently from different textile tissues.

SUMMARY.

1. The basin drained by the Passaic River contains over 900 square miles of territory, and receives annually over 782,000,000,000, or, as daily average, over 2,100,000,000 of gallons of water.

2. Allowing an average loss of one half by evaporation (doubtless an over-estimate), the annual flow of the river at Newark is 390,000,000,000 gallons.

3. The actual daily flow varies within wide limits, as yet undetermined, possibly between 200,000,000 to 300,000,000 per day during the dryest summers, and 2,000,000,000 or 3,000,000,000 or more, during times of flood.

4. The daily flow, with the river at an average height, may be called 1,000,000,000 gallons; more than nine-tenths of which, say 900,000,000, must flow over the Falls of Paterson. The whole discharge of this river is 2.7 times that of the Croton River, which supplies New York.

5. The water belongs naturally to the class known as "peaty" waters, though not largely imbued with this contamination, at least, in the lower part of its course.

6. From the Falls down to the mouth, the peaty matter gradually diminishes in amount.

7. The water is alkaline in character, or at least has a considerable excess of basic over acid constituents. The amounts of lime and magnesia vary at times, but do not differ much from the average of the Croton water.

8. In the lower part of its course, at least, the river contains in solution quantities of *nitrates*, sufficient to be easily and accurately determined by delicate analysis.

9. These nitrates are increased in quantity by flowing through the city of Paterson, and again nearly doubled by flowing through Newark.

10. These (or their nitric acid) are derived from the oxidation of the animal excretions and other similar refuse that pass into the river at Newark. Paterson, and elsewhere, from sewers, slaughter-houses, and other sources; materials that would otherwise remain in the water in a state of putrefaction.

11. There is no reason to believe that these nitrates affect health in any way whatever.

12. The oxidizing power of this alkaline river-water, in the *autumn* season, is so great, that but slight traces of the sewer-matter can be detected, after flowing but four miles through the channel; so little being left that the water acquires no odor on being kept in a closed bottle at 60° Fahr. for one month.

13. There are as yet no results on record in the way of tests during the *summer* season, when the water absorbs much less oxygen.

14. This water allows the germination, and supports the growth, of green confervoid vegetation in its bosom, under favorable circumstances, until after it has passed through the city of Newark, when it *loses this power*; losing some of its constituents at the same time, while gaining others, and changing materially in composition.

15. In the opinion of the undersigned, it will not be safe to have sewers from the city of Newark, *at any season*, discharge into the river nearer to the pumping works than they do at present; unless the water is conducted to the pumps from a point correspondingly further up the river.

16. This latter precaution is suggested for adoption at once, so long as the present pumping stations are adhered to.

17. It is suggested also that the practicability be examined into, by the Engineer of your Board, of keeping the water, in at least one of the reservoirs, during the summer months at least, in a condition of slow intestinal motion or agitation, in order to promote absorption of oxygen, and consequent destruction of organic impurities.

18. No metallic or mineral poison can be detected, as cast into the stream at Paterson; nor could any such remain in solution therein for any length of time.

All of which is respectfully submitted.

HENRY WURTZ.

* The mean annual rainfalls were, for a series of years:

For Newark.....	50.2
For Paterson.....	51.3
For Dover.....	50.1
Mean.....	50.5

Correspondence.

[Correspondents, in all cases, should sign their communications with their names and address in full—not necessarily for publication, but as a guarantee of good faith.—ED.

☞ NOTICE.—Correspondents not intending their letters for publication must mark them "Private."

Further on the Gas Strikes.

OFFICE OF THE ENGINEER)
CHICAGO GAS-LIGHT AND COKE CO.,)
CHICAGO, ILL., June 5, 1873.)

Mr. Editor: In looking over the AMERICAN GAS-LIGHT JOURNAL for May 16, 1873, I notice your article entitled "History of the Gas Strike," which prompts me to send you a short communication upon the same subject, giving the particulars of our experience in dealing with this important question, and if it shall prove of any utility to the gas fraternity, I shall have accomplished my object.

I have been acting engineer of the Chicago Gas-Light and Coke Company's Works for over sixteen years, during which time we have had but two strikes; the first in 1857, the next in 1872. My plan is always to anticipate and checkmate any movement of this kind, by making such advance in the rates of wages, as the demand for labor may justify, without waiting for any demonstration for that object on the part of the workmen. The strike in 1857 was a small matter and soon satisfactorily arranged; that of last year, however, was more formidable, and threatened at one time to occasion serious embarrassment, but was adjusted with the men by acceding to their request for an increase of pay.

The particulars of the last strike are these. Our men in the retort house formally requested of the company an advance in their rates of wages, and their petition not meeting with the prompt attention which, in their opinion, they were justified in expecting, they resorted to a strike—their panacea—to extort that which they had before requested. Our directors then increased their wages 20 per cent., upon which terms everything is now progressing harmoniously.

We recently adopted a new system, by which the company is in a great measure protected from any precipitate action in this direction on the part of the workmen. It consists of a written contract, mutually entered into by which all the employees bind themselves to give written notice of their intention to quit work fifteen days previous to the date they propose to leave, or forfeit the wages due them, which may be in the hands of the gas company. Since this plan has been in operation not a single man has left with-

out giving the proper notice. Neither are we further troubled with threatened strikes.

We find, under this regulation, that the workmen give less heed to agitators, more consideration to the consequences of indiscreet and hasty action, and evince a livelier appreciation of their own interests. We have never yet been required to limit the supply of gas to our consumers on account of strikes, but always have been able liberally to meet the demand. I do not admit that such a serious inconvenience to gas consumers is justifiable, and consider that at least temporary concessions should be made, rather than involve the public in such a misfortune. It may be that many managers of works are trammelled in their actions by injudicious interference on the part of officers, who do not fully realize or comprehend the situation, and are thereby coerced against their better judgment.

In 1860 I advertised in the columns of your Journal my patent "Gasholder Safety Balance," and recently I have patented a new arrangement of hydraulic mains and connections, possessing many new features which, I am convinced, afford numerous great advantages over those at present in general use, and propose to bring it to the notice of the gas fraternity.

I shall take pleasure in occasionally communicating with you, and avail myself of the invitation extended to gas men, in the article spoken of.

The Journal of June 2nd has just come to hand. In the article entitled "A New Gasholder for the Louisville Gas Works," quoted from the Louisville *Evening Ledger*, the following erroneous statement occurs: "The holder, which is the *first* ever erected by Western or Southern mechanics." And again: "The gasholder of this kind (telescopic) had never been erected except by Eastern mechanics." Without attempting to detract from the credit due Mr. Long for his endeavors to develop home industry, justice to other Western contractors require that this mistake should be rectified. In 1853, the firm of Mason & McArthur of Chicago (the former at present Presidentof the Board of Police Commissioners, the latter now Gen. John McArthur, Postmaster in this city) erected for this company a telescopic gasholder, one hundred feet diameter, which was in operation until the fire of 1871. These facts would indicate that according to the Louisville *Evening Ledger*, Chicago has been alive to the necessity of encouraging home industry, at least 20 years in advance of Louisville.

Respectfully yours,
PETER T. BURTIS.

Further Still.

NEW YORK, June 5th, 1875.

Mr. Editor: The eight hour fizzle (as far as the gas stokers are concerned) having subsided, it may not be out of place to take a slight retrospect of this branch of our social relations with the question at issue. What do the facts disclose? Nothing less than another phase of the Ring business, which is undermining the utility of the whole commercial community—every industry is converted into a political machine. No unity of purpose, no sympathy between employer and employee—dollars and cents—and how to get the most of them for the least work is the all-prevailing question. Under these circumstances eight hours this year would be six next year; that is if the feelings of the one party were alone consulted. The selfsame feeling with the employers—how to get the greatest service for the smallest remuneration. With such feeling each party takes its stand—the result is what we see every day. When the particular ring fancies itself strong enough it tries to crush or cripple its antagonist.

The gas stokers in this struggle left out one important element in their calculations, namely, the facility of making gas stokers, where the raw material is so abundant as it is in New York, which together with the high wages paid, makes me think (although they know they can make temporary mischief) their combination will be for the present fruitless.

I believe I am right when I say a gas stoker at $3.50 per day, even if he stays at the works twelve hours, is better paid than most mechanical trades, that take years to acquire; whereas a moderately strong laborer will make a perfect gas stoker in two weeks.

The sensational papers instead of looking at the question fairly, told the public these poor, ill-used stokers were martyrs, whose life would not last over eight years, while the men laughed and said, "That's so," and quote from the Metropolitan Works how many deaths have taken place in three years, when from facts gathered at those works the chief cause was *bad whiskey*. If men will be so foolish as to fill themselves with liquid fire, and then expect to draw and charge retorts, they must be very inconsiderate. They are worse off than a man between two fires, for they have got the worst kind of fire inside of them. In opposition to this theory, I can state that my father worked in a retort house thirty-three years until he was seventy, and is now alive and well, and I do not think during the whole of that time, he was out of the works two weeks altogether.

I trust that the new association of gas interests may develop into good results, not only for the companies but also for their consumers, which will be the surest method to stop competitors, who to get custom invariably promise gas at 20 per cent. less, run in their groove for six months, and then fall into the old track.

Respectfully yours,
ENGINEER.

A British iron and steel company have purchased 1000 acres of land for the purpose of working a rich seam of silkstone coal, which lies at an average depth of 380 yards, and is expected to yield several millions of tons of that mineral.—*Iron Age*.

PRICES OF FOREIGN AND DOMESTIC GAS COALS.

[Reported Expressly for this Journal.]

JUNE 16, 1875.

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Kirkless Hall	16 50	@	17 00
English Caking Coals.			
Newcastle Gas	$12 00	@	00 00
Liverpool caking	11 50	@	12 00
British Province Coals.			
International—At Sydney, $2 50 in gold			— —
Block House—At Mines, $2 50, Gold			0 00
Little Glace Bay—At Mines, 2 50 Gold			— —
Pennsylvania Coals.			
Penn Gas Coal—At Amboy	$8 50	@	0 00
Westmoreland—At Amboy	8 50	@	0 00
(In New York both the above coals $9 10)			
Shafton	9 10	@	0 00
Youghiogheny—At Baltimore	7 50	@	0 00
West Virginia Coals.			
MurphyRun	$7 50	@	8 75
Despard—At Baltimore	6 30	@	0 00
West Fairmont	8 60	@	0 00
American Gas Coal	8 50	@	0 00
Fairmont	8 50	@	0 00
Newburgh Orrel	8 50	@	0 00
Pinnickinick	8 50	@	8 75
Cloverhill of Virginia	6 75	@	7 00
McKenzie Compound Mixture			— —
American Cannel Coals.			
Peytona of West Virginia	$15 50	@	00 00
Darlington of Pennsylvania			— —
American Cannel	$14 00	@	00 00
Asphalts.			
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Ritchie Mineral of West Virginia	20 00	at Balt'e.	
Trinidad Bitumen	— —	@	14 50

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Cost 70 cents per bushel. One bushel for each square foot of Purifier sufficient. Rights to use for life of Patents, for daily makes of gas in thousands; under 25,000 $200; under 50,000, $400; under 100,000, $500; $250 additional for each additional 50,000 per day.

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AND

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Editor's Private Office, 12 Hudson Terrace,
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(Immediately fronting the Ferry Houses.)

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☞ All communications to be addressed to "THE EDITOR, No. 42 Pine Street, Room 18, New York.

MONDAY, JUNE 16, 1873.

WISHING TO MAKE THIS JOURNAL an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of these subjects a pleasure, or a profession.

Subscribers would confer a favor upon us by remitting *CHECKS*, or *POST OFFICE MONEY ORDERS*, as we are frequent losers where money is enclosed in letters.

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SPECIAL NOTICE.

The private office of the Editor of this Journal, for consultation and correspondence; and as Secretary of the Gas-Light Association, is at

No. 12 Hudson Terrace,
Hoboken, New Jersey.
(Immediately fronting the Ferry Houses.)

THE NEW ORLEANS LITIGATION.

The following document belongs to the history of the affair referred to in our last. It is appended to the Argument of the Hon. John A. Campbell, and hence, we presume, he is responsible for it.

"THE CRESCENT CITY GAS-LIGHT CO."

The undersigned subscribe to the number of Shares in the Capital Stock of the Crescent City Gas Light Company, as signified by the amounts opposite to their respective names, according to the terms of the Charter of said company, incorporated by act of the General Assembly of the State of Louisiana, No. 97, approved April 20th, 1870:

Name.	Residence.	No of Am't. Shares
J. H Oglesby.....	New Orleans	3000
F. J, Pratt, J H D.	"	100
F. W. Perkins....	"	3000
W. Hawksworth..	"	1500
A. B Long.....	"	1500
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Robt. L. Belden..	"	400
Jules Cassard.....	"	450
Robt. J. Ker.....	"	450
		30,000 Shares.

I hereby certify that the foregoing is a true and faithful copy and a fac simile of all the original erasures, pencilings, writings and summing up of the original book of subscriptions to the stock of the Crescent City Gas Light Company, and I further certify that the whole number of the fifteen hundred shares additional stock claimed by W. Hawksworth, has been subscribed for and said original book of subscription has been closed in conformity with the Charter of the company.

Robert J. Ker, Secretary.

New Orleans, December 7th, 1871."

Our readers will of course note the "pencil" notes with interest. We don't pretend to understand them, but the imagination may nevertheless be excercised upon them by those who choose to exercise it. Our own duty is to put facts, or what are represented to us as such, on the historical record. Any who might possibly think themselves thus aggrieved, have their easy and obvious mode of appeal to the public tribunal before which we ourselves stand; and will meet from us every just facility of access to that tribunal. Our own responsibility, as always maintained in these columns, is chiefly towards that tribunal, whose servant and *mouthpiece* we are.

The little space remaining for this subject will be occupied in echoing the praise bestowed by the New Orleans *Picayune*, as quoted in last issue, on the New Orleans Gas-Light Company, which company was found to be too honorable to be bribed or frightened into a course that might have been, in a strict sense, a violation of *their* obligations to the public. By assenting to, and acting upon, the provisions of the legislative act of 1860, they had become bound in honor in 1873 to give up their monopoly, and even the inducement of an extension of said monopoly twenty years could not tempt them. It is astounding to us, in these latitudes, to find an influential and popular urban newspaper praising a gas company, and is encouraging to the hopes a few—a very few, among them the Editor of this Journal—have cherished and expressed, of bringing about a new era in this respect, when the people shall see, in all our towns, that the real interests of gas producers and consumers are easily reconcilable, and indeed identical.

In New Orleans, at least, it is to be hoped that hereafter the "loose and disjointed thinkers" that too much infest the newspaper press, may not hereafter be so successful in manufacturing personal popularity by fomenting among the people enmity to their gas company, which is in reality, there as elsewhere, one of their staunchest friends and defenders.

A NEW AMERICAN GAS-ENGINE.

Courtesy to the eminent man of science who writes to us, as below, under date of May 29, seems to require, although he did not specially request it (though the letter is not marked "private") the publication of the following interesting extract. At the same time, the Editor, on behalf of himself and the Gas-Fraternity, feels himself impelled to say that in this case there is more than a suspicion of lack of courtesy, as well as justice, on the part of those engaged in bringing this apparatus to the attention of the public.

Long since, on hearing first (*through an Exchange Journal*), of Mr. Brayton's experiments, that gentleman was addressed by letter, without direct reply. A reply came, from another hand, promising advices, which have never come. Hearing, again, through an accidental channel, that the machine was in operation here, at the place designated below by Prof. Silliman, a call was made (in company with some other scientist). Again an understanding was arrived at that this Journal would at once receive such due advices of the system and operation of the new apparatus as would be of use to its readers, but as yet we are without anything but trade-circulars, which there is neither time nor inclination to work up (particularly at the expense of the Journal) into the shape of such exact specifications as the case requires.

The general statements of Prof. Silliman must therefore, so far, suffice. We write "more in sorrow than in anger." If it is thought best, in a case like this, to appeal to others, rather than to that class of the community best qualified to judge of the matter; it is simply our duty to call the attention of this latter class, for whom we especially write, to the fact. It is proper to add that the Editor has not "seen Prof, Thurston's

report"; and regrets this also. No copy, so far as he is aware, has been sent to his address.

[Extract from a letter of Prof. B. Silliman, dated May 29th, 1873.]

I presume you have seen Brayton's Gas Engine, now working at the printing office of Messrs. George F. Nesbitt & Co., Pine street, N. Y.

Have you seen Prof. Thurston's report of his trials of its mechanical value? If not you will find it worth while to reproduce it in your Journal. The engine is a triumph of skill, and the inventors genius in solving the problem of how to burn an exlosive mixture without explosion is completely novel, so far as I know in the annals of invention. You will readily see the importance of this invention to all our gas companies. It will result in a steady increased daylight demand for gas. As 320 feet of gas is the cost of *one* horse power for ten hours work, and no engineer or boiler required, it is plain that *gas power* will steadily work its way into a thousand uses, mechanical and domestic, where steam power would never be thought of. The great desideratum has been for a long time just such a power.

Gas for cooking and gas for power will come in well now to swell the consumption of gas. We need a good manual on gas cooking and gas heating apparatus. Yours very truly,

B. SILLIMAN.

THE NEW OXYGEN-BURNERS FROM VIENNA.

In the last issue we might have added to our remarks on Oxygen-Illumination, that the parties who are engaged in the enterprise here expect soon to have a consignment of the new forms of burners for coal-gas and oxygen, invented by Bernhard Andreae of Vienna, with which the experiments of Schiele were made, recounted in our Supplementary sheet of April 16th. In these burners, it will be recollected, the oxygen burns *outside the gas*, instead of inside, as in all previous plans. These gentlemen hope to get enough of these. burners to light up Union Square, under a contract they have obtained from the "Board of Public Parks" of this city. In any case, the writer has obtained the promise of samples which will enable him to test the interesting invention.

THE DEUTSCH-AMERIKANSCHE GEWERBE UND INDUSTRIE ZEITUNG.

We desire to call the attention of those among our readers who read German to this valuable periodical, which we have for some time received in exchange. It is published twice a month in Newark, N. J., and is now in its second year. Publishers Eurich & Co. Editor A. Daul. This journal doubtless supplies a very important desideratum in this country as a medium of intercommunication between German and American inventors, patentees, andmanufacturers and capitalists; and we anticipate for it, so long as under its present able management a future of success and usefulness.

Death of George Andrews, Treasurer of the Syracuse Gas-Light Company.

Death, ever busy, has just removed another of the old citizens of Syracuse. Mr. George Andrews, treasurer of the Syracuse Gas-Light Company, has been summoned away, at the ripe old age of 80. He had been declining for some time, and his death was not unexpected.

The deceased was born in Connecticut, on the 2nd of December, 1793. While a boy his father migrated to the county of Oneida, in this State, then thought to be almost beyond the bounds of civilization. While still a young man he was given charge of the cotton factories at New York Mills, in which capacity he remained until about the year 1839. Then purchasing a farm in Camillus he removed thither, and made it his home for several years. He gave up farming to engage in the manufacturing business in Troy. There he remained until five or six years ago, when he removed to this city, accepting the position of treasurer of the Syracuse Gas-Light Company, which he held until his death.

Election of Officers.—The regular annual meeting for the election of directors and officers of the Williamsburgh Gas Company was held on Wednesday June 4th, at the office, corner of South Second and Fourth streets. The following gentlemen were elected as directors for the ensuing year: Samuel Willetts, Robt. R. Willetts, Daniel T. Willetts, Edwards W. Fiske, William Hicks, Joseph R. Thomas, and Walter J. Price. Messrs John Broach, Edmund Driggs and George Ricard were elected inspectors of the next annual election.

Carbon Water Filters.—Water standing in a glass globe, the mouth of which was stopped with cotton wool, showed after some days signs of vegetable growth on its surface. The same water, filtered through a carbon filter into a globe free from air, also soon showed like signs of the existence of life. The same water after boiling remained perfectly clear for days. I therefore conclude that carbon filters are useful only in purifying water from mechanical inpurities, as sand, lime, etc., but that they cannot remove any of the so-called germs.—*Scientific American.*

The Greenpoint Gas-Light Company held their annual meeting on the 4th inst., and elected as directors for the ensuing year, Messrs. Samuel Willets, Daniel T. Willets, Robert B. Willets, Joseph R. Thomas, and Edward W. Fiske.

☞ The Editor, though personally a stranger to the gentleman advertising "To Gas Engineers," has *good reason* to believe the advertiser reliable in his statements, and therefore commends them to attention.

☞ The attention of Gas Engineers is called to the advertisement on this page, of A. Gridley, Esq., President of the Bloomington Gas-Light and Coke Company, offering the situation of Superintendent of those works to a man of years and long experience in the management of gas works.

TO GAS ENGINEERS—A YOUNG MAN of liberal education, who has served at Gas-fitting, Laying Street Mains, Setting Lamp Posts, Setting Retorts, and all the daily duties of a large Gas Works, wishes a situation with an active Builder of Gas Works, to learn the profession in all its branches. Is willing to work and anxious to learn. Address C. L., care of Dr. Wm. M. Murphy, 69 West Seventh Street, Cincinnati, Ohio.

Gas-Light and Coke Co.
Of Bloomington, Ill.

This Gas Company's Works have ten benches of Clay Retorts, nine hundred Gas Consumers, four hundred City Gas Lamps, makes an average of one and a half million feet of gas per month. Works are quite new, having been entirely rebuilt in 1867, and are in perfect order.

The Company wishes immediately to employ a thoroughly competent Superintendent; a man of age and experience in the management of Gas Works in all details of the same, who will devote his whole time and attention to the interests of the Company.

To the right kind of a man a liberal salary will be paid, and a permanent situation secured.

A. GRIDLEY, President
Gas-Light and Coke Co., Bloomington, Ill.

☞ The Company wish as Superintendent one of long experience and of strictly temperate habits and good morals. Such a man will find a good situation in the employ of this Company.

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CLOVER HILL
GAS COALS.

We have made arrangements by which, for the first time the celebrated

YOUGHIOGHENY GAS COAL

will be brought to the seaboard.

It is mined on the banks of the Youghiogheny River, near Pittsburgh, and is universally acknowledged to be the BEST GAS COAL known in the world. It will be shipped East and South from

Baltimore, Alexandria, and Georgetown.

AND WEST FROM

Cleveland.

We also offer the well-known

CLOVER HILL GAS COAL,

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This Coal comes from the oldest and deepest mine in America, having been worked for fifty years, and has a wide and favorable reputation.

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335-1y WILLIAM H. BRINES, Sup't.

SITUATION WANTED by a competent Machinist and Gas Engineer, who has had much experience in erecting and altering Gas Works, and the Manufacture of Gas—one who is not afraid to work. No objection to a small or ordinary Works, if in a growing place. Can furnish reference as to ability, etc. Address GAS ENGINEER, Station F. New York Post Office. 335

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OFFICE OF THE ALBANY GAS-LIGHT CO.,
59 STATE ST., ALBANY, NEW YORK.

THIS COMPANY INVITE PROPOSALS FOR THEIR production of COAL TAR, per ton of Coal Carbonized. Bids to be received before the 25th day of June next, addressed to the undersigned, who will give any further information desired. S. W. WHITNEY, Sec'y.
334-3t

S. DECATUR SMITH,
SUCCESSOR TO
SMITH & ELLIS,
IRON FOUNDRY & PIPE WORKS,
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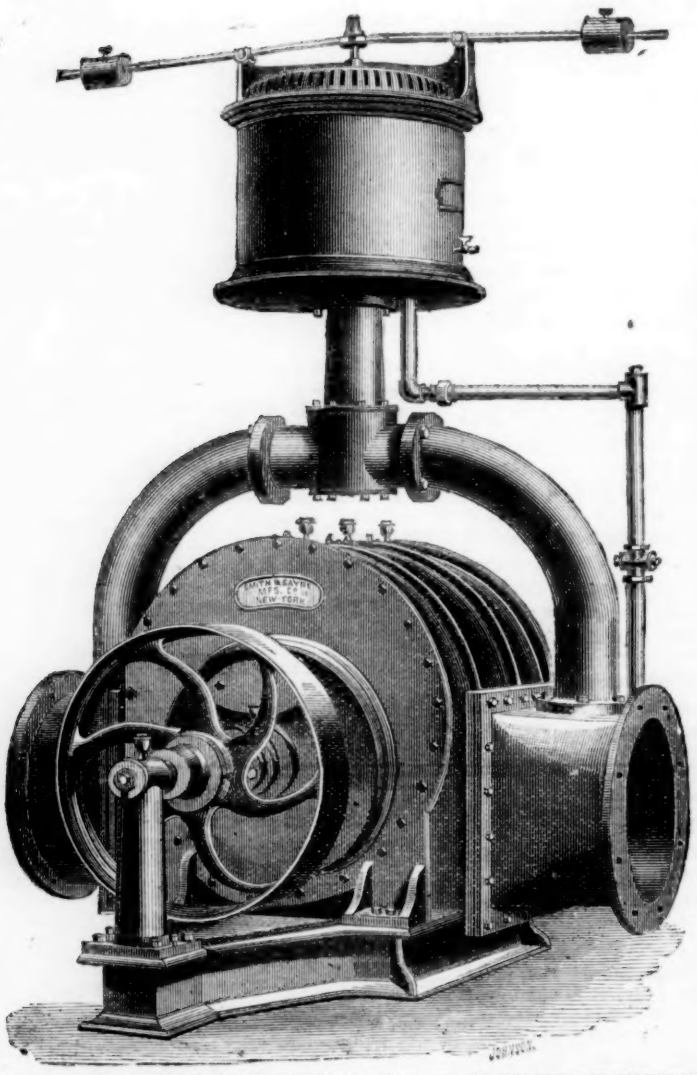

They are made to pass from 4,000 to 150,000 cubic feet of gas per hour; will increase the production and illuminating power of the gas, and add very much to the durability of the retorts, either clay or iron. The Compensator obviates entirely the necessity of water-joints, is compact, durable, cleanly, not liable to get out of order, self-acting, quiet, and certain in its operation.

We are also sole proprietors and manufacturers of the

MACKENZIE PATENT BLOWER, PATENT CUPOLA AND SMELTING FURNACE.

The Blower is a Force Blast machine, durably built, and can be driven with one-third the power required to drive the ordinary Fan.

The Cupolas are manufactured in sizes to melt from 1 to 20 tons per hour, will save one quarter of the time required by the old style Cupola, and 33 per cent fuel. Address

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OFFICE, 96 LIBERTY STREET, New York.

AMERICAN

GAS SCREEN MAN'F'G COMPANY.

TO GAS-LIGHT COMPANIES.

Your attention is respectfully called to the GAS SCREEN now being manufactured by the American Gas Screen Manufacturing Company, under the patents granted to E. DUFFEE, and are pleased to submit the following points of their excellence and superiority over all other screens now in use.

The Screen is made with an oak frame, interlaced with split rattan, drawn through holes at regular intervals in the Frame and cross-pieces, the edges of the frame being grooved to prevent abrasion.

The advantages of the screen are:

1st. The large purifying surface, the construction of the Screen giving over three-fourths of the surface for the gas to penetrate the lime.

2d. On account of the free passage of the gas through the Screen the pressure is reduced, thereby preventing the accumulating of carbon on the retorts.

3d. The saving of lime and labor, as the Screens are not liable to clog, and are easily cleaned.

4te Their cheapness and simplicity of construction.

5th. Their DURABILITY—they can be used longer than any other now used.

Testimonials.

PROVIDENCE, RHODE ISLAND, March 21st, 1872

E. DUFFEE, Esq., Agent, etc.

Dear Sir: The Trays manufactured by you for our West Station were put in use in September last, and have *given perfect satisfaction.*

The frames are well put together, and I see no reason why ey will not last for a long time. The *very large amount of n space* in these Trays gives the gas an easy passage, and brings it into contact with the lime much better than when the space is so contracted, as is the case in most of the other Trays in use.

The pressure thrown upon the retorts by contracted passages is very great, and were gauges used more frequently than they now are in many gas-works, this facat of having *open Trays* would become more apparent to mangers of gas works. The digerence in pressure at this station in passing the gas through your purifiers, is two-tenths (2-10) inches.

The amount of gas purified, per bushel of lime used to this date, is six thousand five hundred and fifty six (6,556) cubic feet.

Respectfully yonrs,
JAMES H. ARMINGTON, Supt.

BOSTON GAS-LIGHT CO., Dec. 1871.

Dear Sir: In answer to your inquiry how we like your Patent Tray for dry gas purifiers, I take pleasure in saying we have used them exclusive of all others, for the last three years, and think them far ahead of any yet offered. The surface being nearly three times that of any other Tray, and their lightness and durability perfectly satisfactory.

Yours respedtfully,
A. M. GILES.

EDWARD DUFFEE, Esq.

EAST BOSTON, JUNE 15, 1871.

Gentlemen: We have used your Screens some five years. They give perfect satisfaction.

I consider them *by far the best Screen* for Dry Lime Purifiers I have seen. Yours truly, A. M. NORTON, Supt.

CHELSEA, May 1, 1871.

Mr. E. DUFFEE.

We are using your Purifying Trays, and find them to be the *best of any* that I have used, and will *purify more gas with less pressure* than any tray that I know. I can fully recommend them, after four years trial, to any Gas Superintendent with perfect safety, as the *cheapest and best Tray made.*

Yours truly, JOHN ANDREW, Sup't.

DORCHESTER, March 3. 1870.

Mr. E. DUFFEE.

Dear Sir: We have had your Gas Trays in constant use for almost one year and six months and find them superior to any others we have ever used, both in point of economy and efficiency. Truly yours, W. B. BROOKS,
Agent Dorchester Gas-Light Co.

JAMAICA PLAINS, MASS., June 21, 1871.

EDWARD DUFFEE, ESQ.

Dear Sir; The Trays ordered by this company three years ago, are getting somewhat worn. I wish to say here that I consider your Trays to be superior to any yet invented, therefore please make us another set at the price named, to be like the sample shown in every way, and oblige Yours truly
JAMES F. ROGERS,
Sup't Jamaica Plains Gas-Light Co.

BROOKLINE, June 11, 1871.

E. DUFFEE, ESQ.

Dear Sir: You will please make a set of Gas Trays for this company as soon as convenient, at price named. In regard to the merits of the Tray, after having them in constant use for over two years, I will say that I consider them *superior to any Tray* manufactured in this country. Respectfully yours,
H. A. ALLYN,
Sup't Brookline Gas-Light Co.

BANGOR, August 2, 1870.

EDWARD DUFFEE, ESQ.

Dear Sir: Yours of the 20th ult. is received. In regard to your Gas Trays, I take pleasure in saying that they have been in use over two years, and have given perfect satisfaction and they are in good order at the present time; should have no hesitation in recommending them, believing they are the most durable and easiest kept in order of any with which I am acquainted. Respectfully yours,
W. H. PERRY, Sup't.

OFFICE OF THE SPRINGFIELD GAS-LIGHT CO.'
SPRINGFIELD, MASS., Oct. 10, 1871.

Mr. WARD,
President Hartford Gas-Light Co.

Dear Sir: I have been using Gas Screens made by the American Gas Screen Company, for nearly a year, and find them superior in every way to the wooden Screens made and formerly used by the Springfield Gas-Light Co. I can purify more gas with the same quantity of lime, there being more surface to the Screens; and I consider them more durable. and recommend them to your consideration.

Yours with great respect,
GEORGE DWIGHT.

ROXBURY, June 14, 1872.

EDW. DUFFEE, ESQ.

Dear Sir: In answer to your inquiry regarding your Patent Gas Screens, I am happy to be able to say, that after nearly three years constant use we are perfectly satisfied with them being able to purify over fifty pet cent. more gas with them, than with any other Screen we have used.

YOURS respectfully,
THOMAS J. FISHOU.

OFFICE DETROIT GAS-LIGHT CO.,
DETROIT, MICH., April 22, 1872.

AMERICAN GAS SCREEN MANUFACTURING CO., HAVERHILL.

Gentlemen: The Screens bought of you work far better than any we have ever used. As a proof, we have with the same quantity of lime purified *twenty per cent*, more gas with your Screens than with any others, and the work well done. The workmen are also better pleased with them—they being light and handy to work. They also relieve the pressure very much upon the retorts, and I cheerfully give yau my experience. Yours truly,
P. E. DEMILL, Secretary.

We give a list of some Gas-Light Companies using them.

Providence, R. I. Gas-Light Co.. Boston, Mass. Gas-Light Co.; East Boston, Mass., Gas-Light Co.; South Boston, Mass., Gas-Light Co.; Springfield, Mass., Gas-Light Co.; New Bedford, Mass., Gas-Light Co.; Manchester, N. H., Gas-Light Co.; Reading, Penn., Gas-Light Co.; Biddeford, Me., Gas-Light Co.; Hartford, Conn., Gas-Light Co.: New Haven, Conn., Gas-Light Co.; New Orleans, La., Gas-Light Co.; Savannah, Ga., Gas-Light Co.; Charleston, S. C., Gas- Light Co.; Trenton, N. J., Gas-Light Co.; Charlestown, Mass., Gas-Light Co.; Dorchester, Mass., Gas-Light Co.; Chelsea, Mass., Gas-Light Co.; Baltimore, Md., Gas-Light Co.; Manhattan, N. Y., Gas-Light Co.; Cincinnati, Ohio.; Gas-Light Co.: San Francisco, Cal., Gas-Light Co.: Albany, N. Y., Gas-Light Co.; Sacramento, Cal.; St. Joseph, Mo., Gas-Light Co.; Leavenworth, Kansas, Gas-Light Co.; Macon, Ga., Gas-Light Co.; Roxbury, Mass., Gas-Light Co.: Lansinghburg, N. Y., Gas-Light Co.; Bridgeport, Conn., Gas-Light Co.; Stamford, Conn., Gas-Light Co.; Poughkeepsie, N. Y., Gss-Light Co; Scranton, Penn., Gas-Light Co.; Lewiston, Me., Gas-Light Co., and one hundred others.

Address **A. P. JAQUES, Treas.,**
Amer. Gas Screen Man'f'g Co., Haverhill, Mass

AGENCY FOR

GIBSON'S IMPROVEMENT

IN THE

Manufacture of Coal Gas,

42 PINE STREET, ROOM 18.

The undersigned having been appointed Special Agent for the introduction of GIBSON'S Substitute for Dip-Pipes in the Manufacture of Coal Gas, respectfully presents for the consideration of Gas-Light Companies the Circulars and Pamphlet issued by the American Coal Gas-Light Imp. Co., descriptive of the value of GIBSON'S Improvement, and the mode by which Gas-Light Companies can satisfy themselves of its usefulness, without trouble or expense, at their own works.

Orders for fitting up Valves of any desired form or patent, *subject to the generality of the Gibson claim*, and also for SUPPLIES and MATERIALS of every description required for the use of Gas Light Companies promptly attended to by

W. H. GRENELLE, Special Agent.

REFERENCE.—RICHARD MERRIFIELD, Esq., late Vice President MANHATTAN GAS-LIGHT COMPANY.

WILLIAM FARMER,

ARCHITECT AND GENERAL GAS ENGINEER,

111 BROADWAY, TRINITY BUILDING, Room 95, New York.

WILLIAM FARMER may be consulted upon all matters connected with the construction of GAS WORKS and other buildings. Will furnish General and Detail Drawings, Specifications and Estimates for Gas Works of any capacity, Retort Settings, Condensers, Washers, Exhausters, Purifiers, Holders, Coal Hoisting Apparatus, Iron Roofs, and every description of Machinery required in the Manufacturing of Gas.

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REFERENCES:

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SAMUEL DOWN, President American Meter Company, N. Y.
C. VANDERVOORT SMITH, Engineer Manhattan Gas-Light Company, N. Y.
CHARLES MOWTON, Engineer New York Gas-Light Company, N. Y.
SAMUEL P. PARHAM, Engineer Mutual Gas-Light Company, N. Y.
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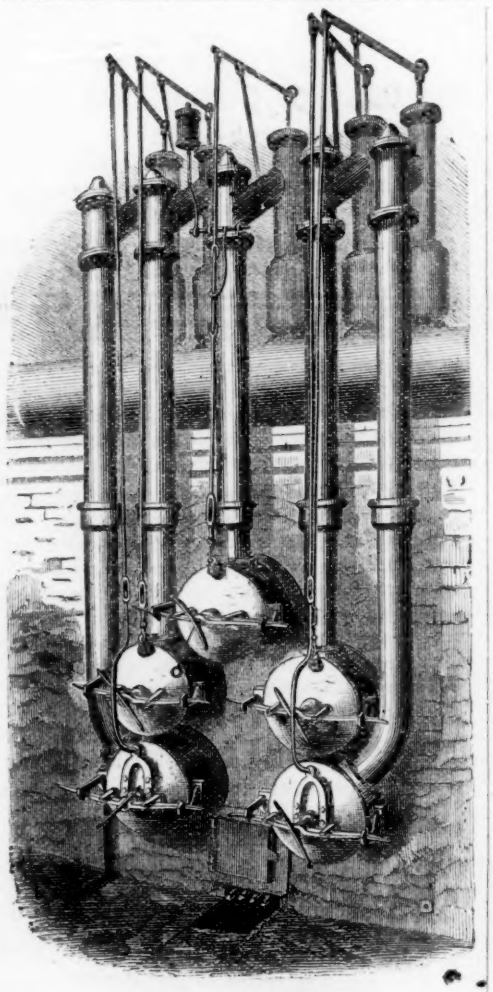
JAMES R. SMEDBERG, Consulting Engineer, San Francisco Gas-Light Co., Cal. [254-



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Improved Retort Lids.

The Seal closes automatically, when the retort-lid is removed, and is broken by replacing the lid. No mistake can possibly be made. The rods are adjustable in a moment to any contingency. The new attachments are adaptable to any Works. Cost only that of rough castings. No lute used, and no leakage at lids. Half the number of lids only needed. Capacity of mains greatly increased. In new Works no mains No carbon in retorts, seldom in stand-pipes. Addre

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I am now prepared to place in the market, through my agencies as below, a regular and unlimited supply of this valuable Cannel, for gas purposes. A recent analysis, by Prof. WURTZ, Editor of this Journal, at the Laboratories of the NEW YORK GAS-LIGHT COMPANY, gave 47½ per cent of Volatile Matter and 45 bushels to the ton of a fair quality of coke. The yield of gas was at the rate of 9,500 feet per ton of about 27 candle power. It is not highly sulphurous, can be purified by Lime, and the ash from the coke does not clinker.

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MANUFACTURERS of every kind of Gas Machinery, Retorts Bench Castings, Wrought Iron Work, Multitubular and Air Condensers, Washers, Scrubbers, Purifiers, Exhausters with every equipment complete for large or small Works, Gasholders, Telescopic or Single; Iron Roof Frames with Cornice Gutters, covered with Corrugated Iron or Slate; Iron Doors and Iron Pivot Blind Windows; Coke Barrows, Fire Tools, Retort Lids, Cotter Bars and Screws, Stop Valves, Tar Valves for Regulating Dip in Hydraulic Mains, Pressure Governors for Street Mains, and Compensators for Exhausters that are unrivalled for unvarying accuracy Steam Engines, Boilers, Etc., Etc.

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CAUTION.

SEVERAL CONTRIVANCES HAVING BEEN DEVISED for the purpose of dispensing with the dip-pipe seal, by means of a valve, or cut-off, between the retort and the hydraulic main, in gas works, since this method of making gas was introduced by the AMERICAN COAL GAS LIGHT IMPROVEMENT COMPANY, all of which are infringements upon Letters Patent, numbered 95,459—116,450—and 119,135, owned by said Company. All Gas-Light Companies are cautioned against the use, without license or authority from the undersigned, of said devices.

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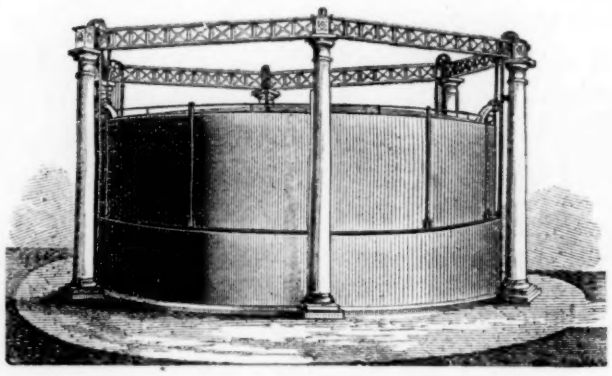

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Coke and Coal
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Perfect in their operation, a very strong, and from their great durability vastly more economical than any substitute. Refer to all the principal gas Companies in the country, who acknowledge them as the "ne plus ultra of Coke Screening Shovels.

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Sole Agent,

No. 96 Maiden Lane, N. Y.

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O. R. BUTLER,
96 Maiden Lane, N. Y.

OFFICE OF

THE GAS-LIGHT CO. OF AMERICA

C. K. GARRISON, President.
E. W. McGINNIS, Secretary and Treasurer.
JOHN P. KENNEDY, Chief Engineer.
LEONARD D. GALE, Consulting Chemist.

GENTLEMEN: We beg leave to inform you, that we have purchased the Patent process for making ILLUMINATING GAS from PETROLEUM and its products, known as the

Gale and Rand Patents,

and we are now prepared to treat with you for the use of said process by your Company.

We are also prepared to contract for putting said process into successful operation in your works, furnishing all the necessary plans, materials, and workmen for that purpose.

We do not deem it necessary to enter upon a detailed description, here, of the processes above referred to, deeming it sufficient to state, to secure your interest and investigation, that they have been in successful operation, for months, in a number of Gas-Light Works in the United States, and are now being introduced in the works of the Mutual Gas-Light Company, of New York City; the Citizens' Gas-Light Company, of Brooklyn; the New Orleans, San Francisco, and very many other Gas-Light Companies throughout the country.

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To Gas Light Companies throughout the country.
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Mines in Harrison County, West Virginia.
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We offer special inducements to parties wishing to purchase. My Pipe is Smooth, regular in weights, and cast vertically.

N. B.—Pipe from 3-inch and upwards, cast in 12-ft. lengths.

☞SEND FOR CIRCULAR AND PRICE LIST. 21

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CHARLES MACKALL, Secretary.

CHARLES W. HAYS, Agent, Room 7, 111 B'way, N. Y.

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This coal yields 10,000 cubic feet of Gas, with an illuminating power of over 16 candles. Forty bushels of very superior Coke, with little Ash, and scarcely any clinker. 304-1y

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EDITOR—PROF. W. H. WAHL, PH.D.

ASSISTED BY THE COMMITTEE ON PUBLICATIONS.

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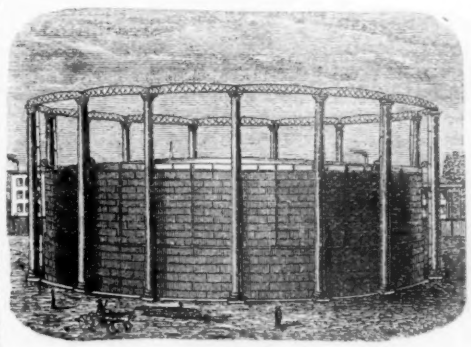

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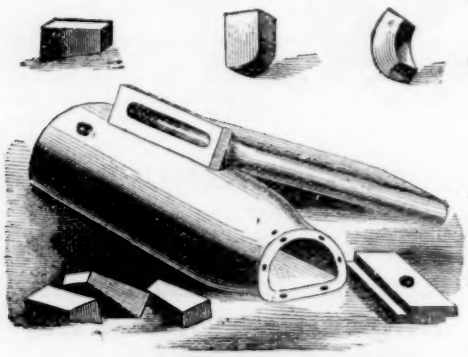

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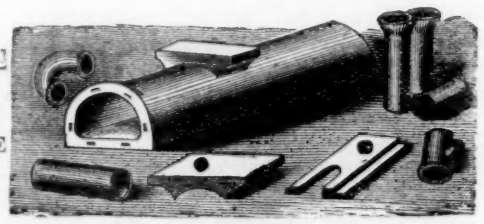

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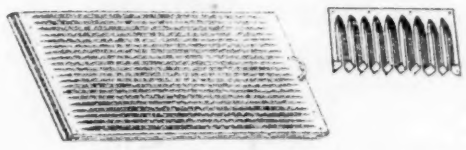

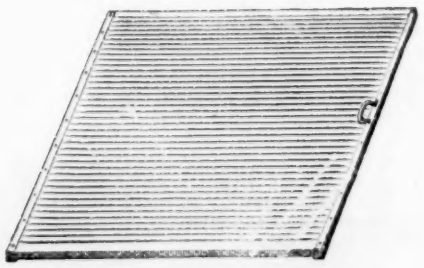

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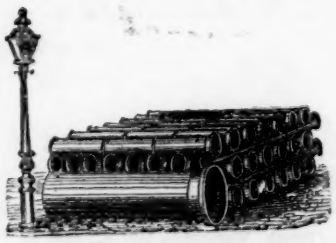

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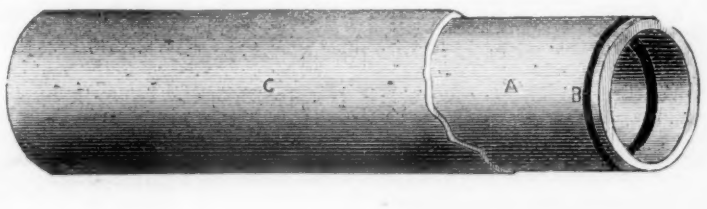

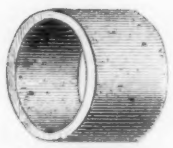

FIG. 2.

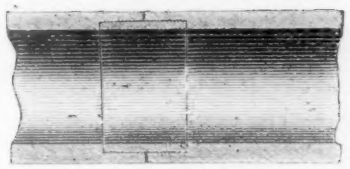

FIG. 3.

A—Cylinder of Wood. B—Band of Iron. C—Coating of Hydraulic or Asphaltum Cement.

FIG. 2.—Thimble for Connection. FIG. 3.—Horizontal Section and Connection.

Above is a cut of the

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This Pipe is made of White Pine, one inch to sixteen inches bore, in sections eight feet long rounded in a lathe, coated inside and out with Asphaltum, connected with a tenon, or socket, and a thimble joint, perfectly air and water tight, being driven together with cement furnished by the Company. When laid its cost is about one half that of Iron Pipe, and is UNQUESTIONABLY the best Gas conducting Main in use.

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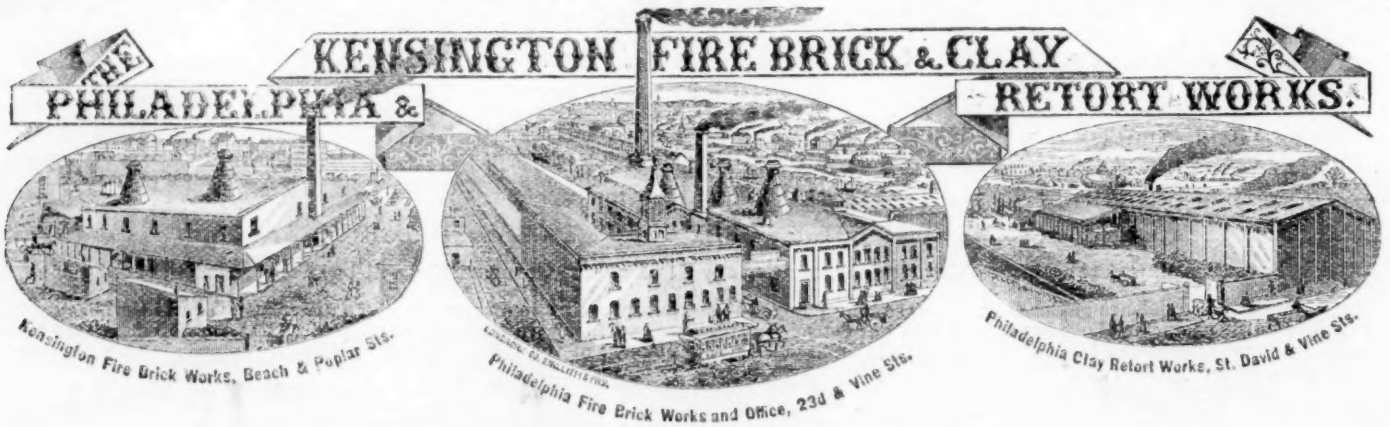
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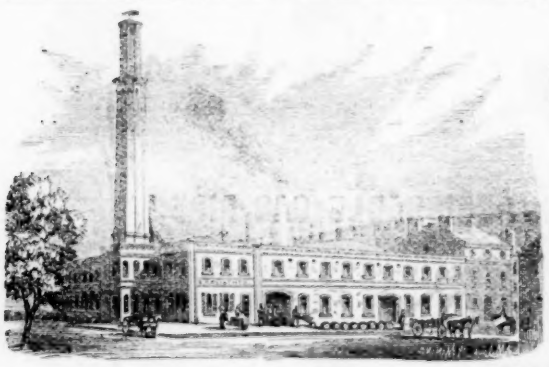

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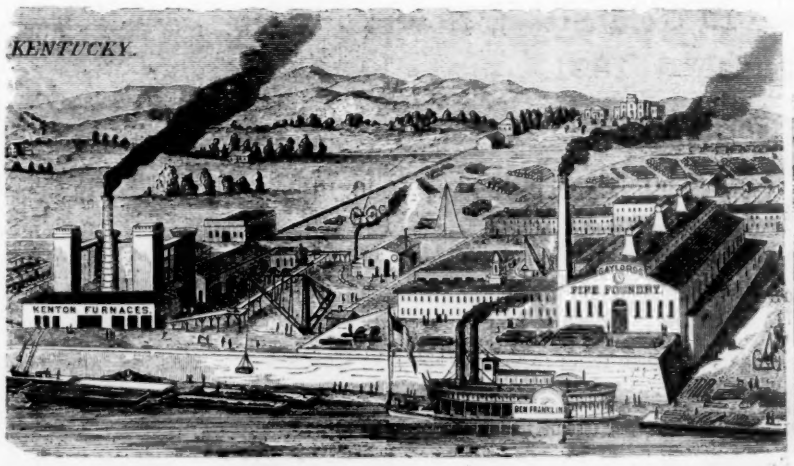

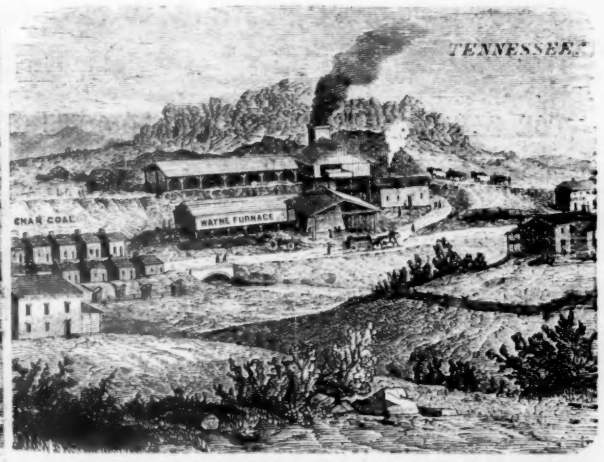

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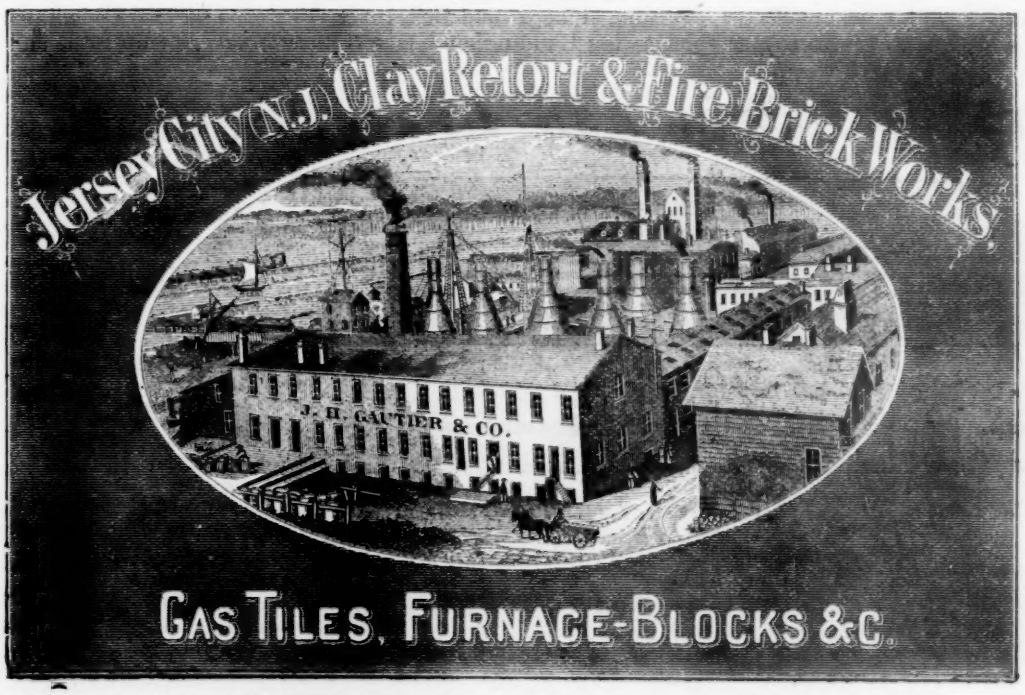

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This process is not only safe, simple and effective, but costs little to apply. The only machinery necessary is a one and a half inch stop cock, and a half inch stop cock to each bench No alteration in the old system is required. In fact, a Works operated with this process, can at any time be operated on the old pressure system, simply by closing the two stop cocks above mentioned. There is nothing to get out of order, nothing that requires special attention; no stuffing-boxes to pack and keep tight, no valves to keep clear of tar and pitch, no levers to lubricate, and no expense for a great amount of machinery.

The McIlhenny process challenges the world as regards yield and quality of gas.

For particulars apply to GEO. A. McILHENNY, Engineer of the Washington Gas-Light Co., Washington, D. C., or to WILLIAM YORKE, Engineer of the Portland Gas-Light Co., Portland, Me., who will take pleasure in corresponding with any one interested. 807-1y

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CONDENSERS.—Single and Multitubular Air and Water Condensers.

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CARRIAGES.—Movable Lifting Carriages for Purifiers, arranged either for Floor or Overhead use.

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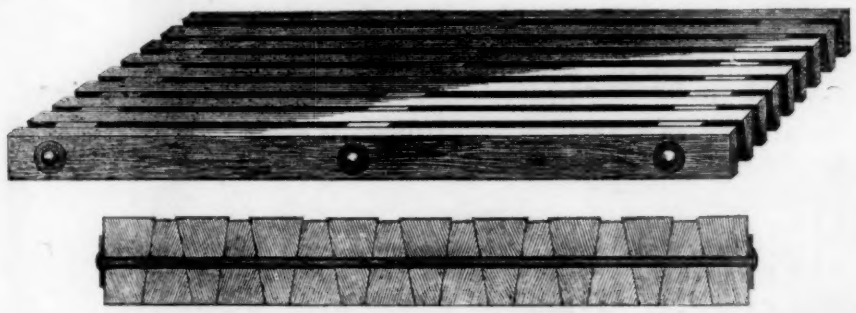
GAS HOLDERS.—Single Lift and Telescopic Gasholders, with Cast or Wrought Iron Suspension Frames.

GAS GOVERNORS.—Station Governors, with Regulating and Indicating Columns for Inlet and Outlet Pipes, also Dry Governors with Flexible Diaphragms for Underground Pipes.

STOP VALVES.—Double Faced Stop Valves for Gas or Water, from three inches to forty-eight inches diameter. These Valves are proved on both sides, with a heavy Water Pressure, Flange and Bell Pipes, Fittings and Drips of all descriptions. Steam Boilers and Hot Water Apparatus for Heating Building, and Gas Holder Tanks. Lamp Posts and Lanterns.

P. Munzinger's Patent Ash Lime Trays.



In use at the following Gas-Light Companies:

Pittsburg Gas Company, Pa.
Peoples Gas Company, Baltimore.
Lowell Gas-Light Company, Mass.
Lynn Gas-Light Company, Mass.
Albany Gas-Light Company, N. Y.
Schenectady Gas Light Company, N. Y.
Utica Gas-Light Company, N. Y.
Jersey City Gas Company, N. J.
St. Paul Gas-Light Company, Minn.
Cumberland Gas-Light Company, Md.
Hartford City Gas-Light Company, Conn.
Richmond Gas Company, Va.
McKeesport Gas Company, Pa.
Middletown Gas Company, Pa.
East Newark Gas-Light Company, N. J.
Binghampton Gas Company, N. J.
Zanesville Gas Company, Ohio.
New Orleans Gas Company, La.
Salem Gas-Light Company, Mass.
New Britain Gas Light Company, Conn.
Rahway Gas-Light Company, N. J.
Trenton Gas-Light Company, N. J.
Elmira Gas Company, New York.
Erie Gas Company, Pa.
Columbus Gas-Light Company, Ohio,
Westchester Gas-Light Company, N. Y.
Santa Cruz Gas Company, Cal.
Lawrence Gas-Light Company, Kansas.
Salem Gas Company, N. J.
Indiana Gas-Light Company, Pa.
Peoria Gas Company, Ill.
Montclair Gas Company, N. J.
Williamsport Gas Company, Pa.
Wooster Gas-Light Company, Ohio.
Augusta Gas-Light Company, Ga.
Huntsville Gas Company, Ga.
Chattanooga Gas Company Tenn.
Murfreesboro Gas Company, Tenn.
Hagerstown Gas-Light Company, Md.
Hanover Gas Company, Pa.
Easton Gas Company, Pa.
Uniontown Gas-Light Company, Pa.
Coatesville Gas-Light Company, Pa.
Houston, Gas Company, Texas.
Wilkesbarre Gas Company, La.
Middletown Gas Company, New York.
Washington Gas-Light Company, Pa.
Princeton Gas-Light Company, N. J.
Newark Gas Company, Ohio.
Pontiac Gas-Light Company, Mich.
And numerous other Companies.

LB JL '09